IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

May 25, 2016
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

December 11, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration

nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On May 25, 2016, a State and Local Ambient Air Monitoring Station (SLAMS), located in Brawley (AQS Site Code 06025007) California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) a 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentration of 165 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements above 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley was the only station in Imperial County to measure an exceedance of the PM_{10} NAAQS on May 25, 2016.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON *MAY 25, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
5/25/2016	**Brawley**	**06-025-0007**	**3**	**23**	**165**	**150**
5/25/2016	Calexico	06-025-0005	3	24	79	150
5/25/2016	El Centro	06-025-1003	4	15	17	150
5/25/2016	Niland	06-025-4004	3	23	76	150
5/25/2016	Westmorland	06-025-4003	3	23	119	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On May 25, 2016, the Brawley monitor was impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds associated with a low-pressure trough that moved through the area.

This report demonstrates that a naturally occurring event caused an exceedance observed on May 25, 2016, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM_{10} 24-hour NAAQS exceedances of 165 µg/m^3 (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[1].

I.1 Demonstration Contents

Section II - Describes the May 25, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley monitor.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley station this section discusses and establishes how the May 25, 2016 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the May 25, 2016 event and its resulting emissions defining the event as a "natural event".[2]

Section IV - Provides evidence that the event of May 25, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published on May 25, 2016 (Wednesday), the San Diego and Phoenix National Weather Service (NWS) office area forecast identifying the movement of a low pressure trough through Southern California that would be bringing gusty winds and breezy conditions into the

[1] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

[2] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

area. The San Diego NWS weather story explained that a few showers already had developed and that a few thunderstorms were possible primarily over the mountains. Overall, the San Diego NWS office forecasted strong winds within the mountains and deserts with local gusts exceeding 40 mph with pockets of blowing dust in the desert. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County on May 25, 2016. **Appendix A** contains copies of notices as they were issued either as forecast information prior to or on May 25, 2016.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentrations from the Brawley monitors on April 17, 2017. The INPEE, for the May 25, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently thereafter, a second revised request was sent to CARB requesting preliminary flags on additional days for 2016. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for May 25, 2016. A brief description of the meteorological conditions was provided to CARB, which provided preliminary information that indicated a potential natural event had occurred on May 25, 2016.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 31, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentration of 165 $\mu g/m^3$ on May 25, 2016 in Brawley (**Table 1-1**). The final closing date for comments was March 2, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the May 25, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on May 25, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly "affects air quality" such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event "is not reasonably controllable and not reasonably preventable."
- e The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
- f The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II May 25, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the May 25, 2016 event unfolded in Imperial County. The subsection elements include

» A description and map of the geographic setting of the air quality and meteorological monitors
» A description of Imperial County's climate
» An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1**).The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994).

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter) mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

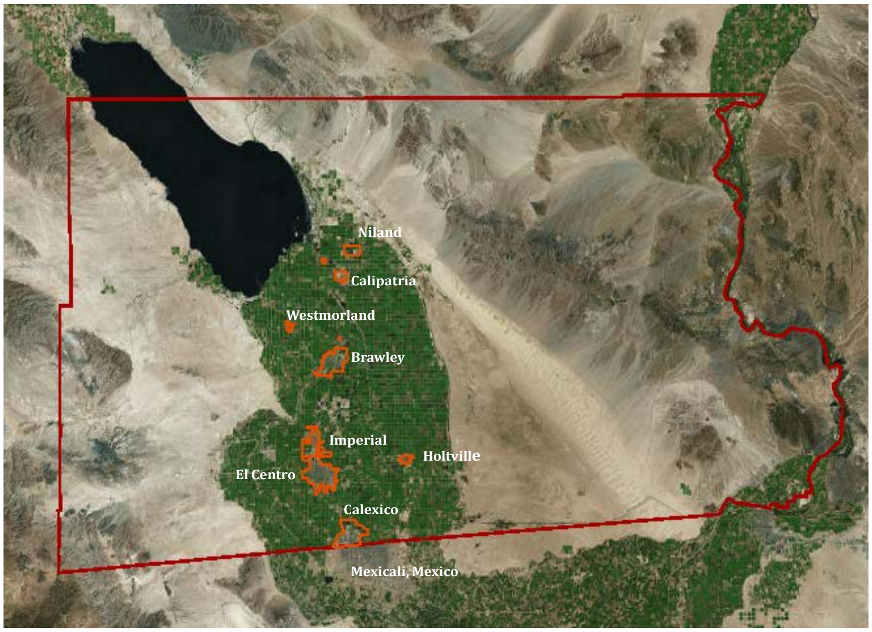

Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

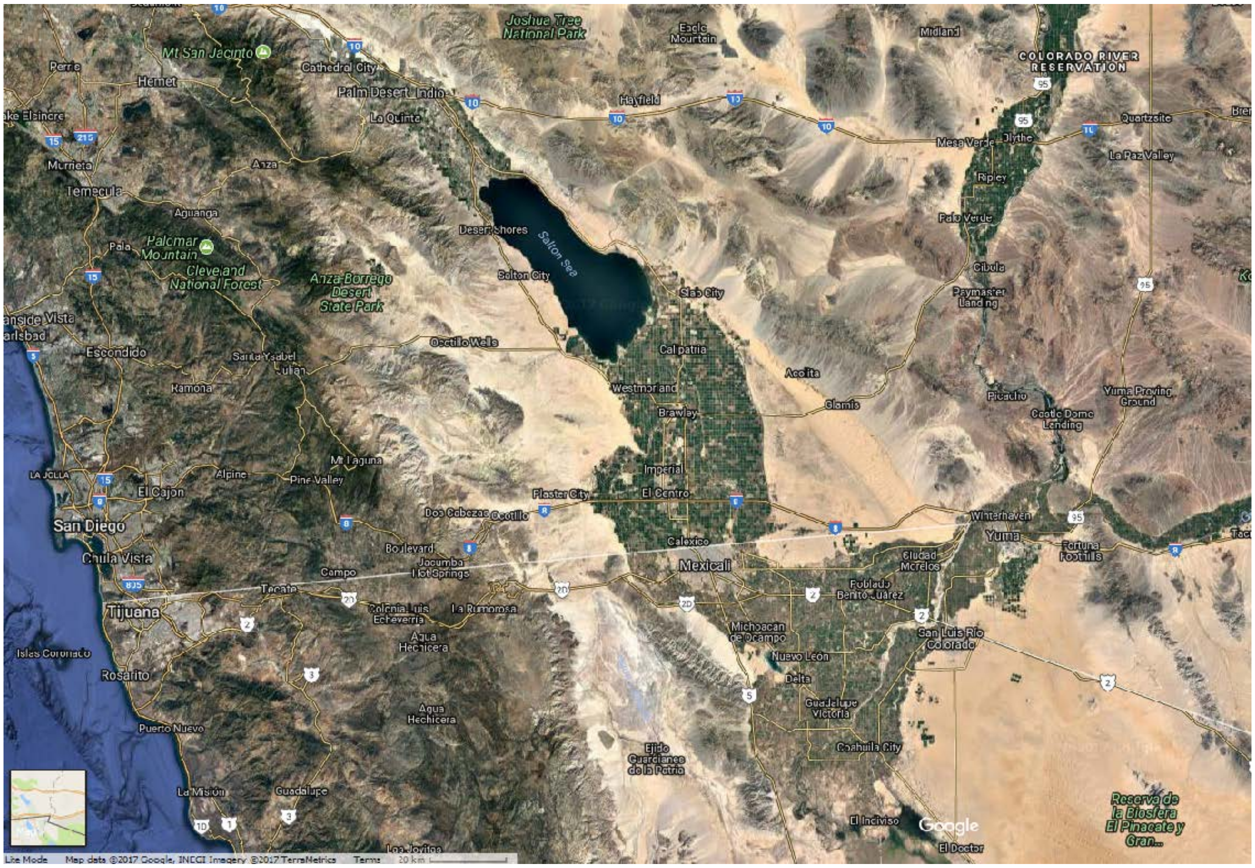

Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedance on May 25, 2016, occurred at the Brawley station. The Brawley station is regarded as a “northern” monitoring site within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on May 25, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

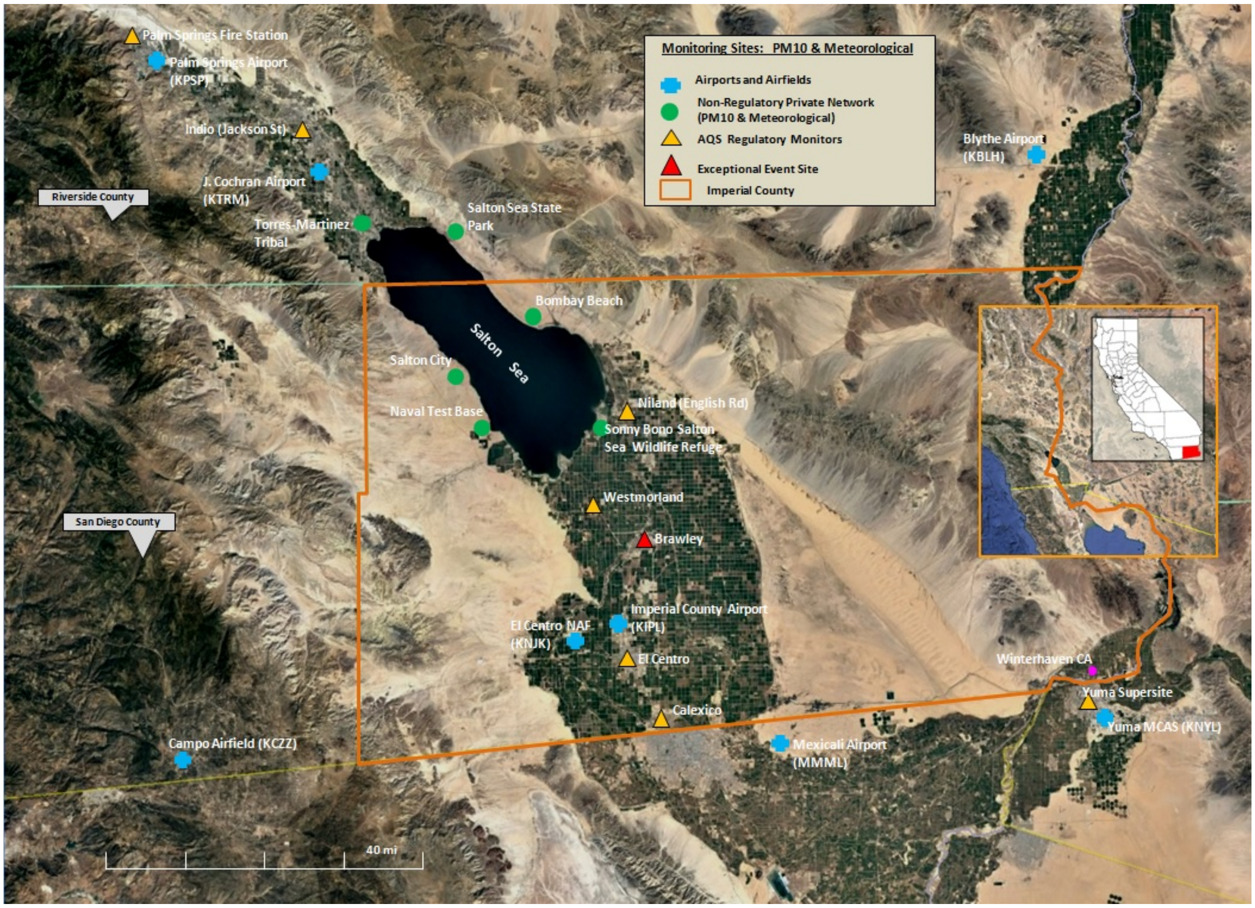

Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth.

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

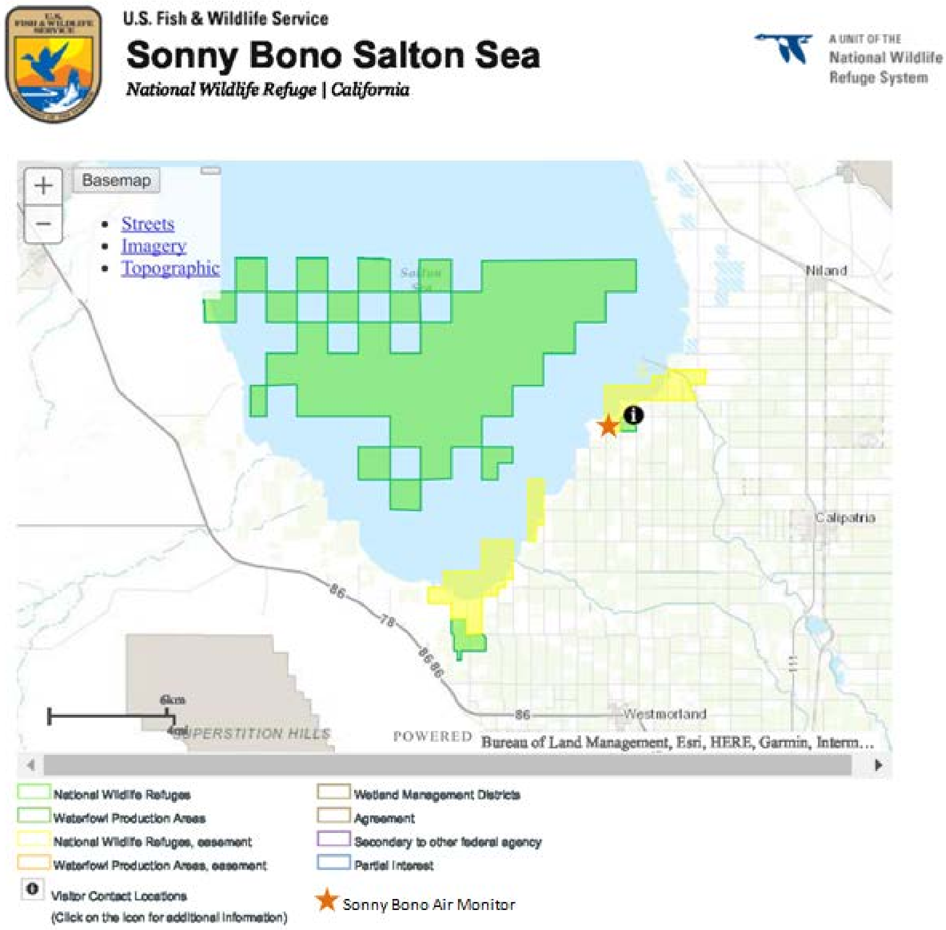

Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MAY 25, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					165	660	18:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	79	722	16:00	19.2	16:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	17	38	14:00	14.4	14:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	25.5	15:00
		BAM 1020					76.1	282	18:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	119.1	573	02:00	14.3	19:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	17.6	50	14:00	11	14:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	68.8	0:00	15:00	15	15:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	82.3	359	17:00	-	-

*CARB = California Air Resources Board
*ICAPCD = Air Pollution Control District, Imperial County
*SCAQMD = South Coast Air Management Quality District
*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

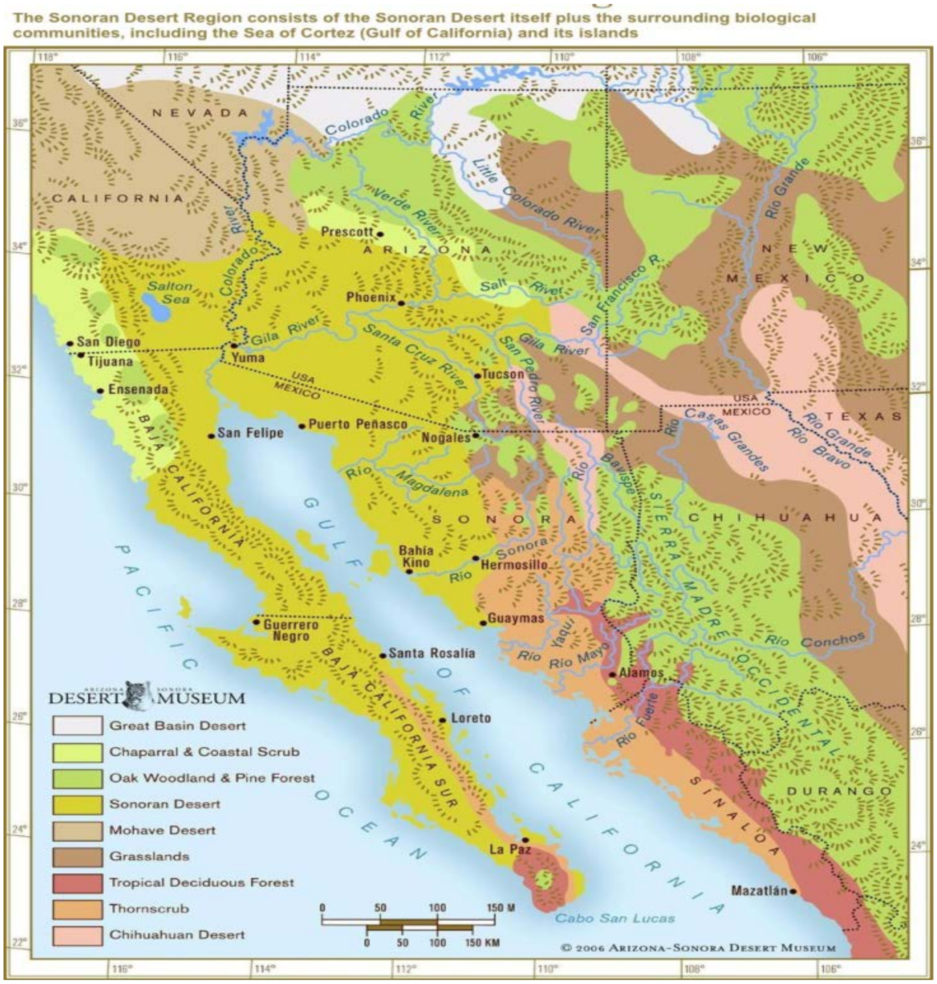

Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16)**. During the 12-month period prior to May 25, 2016 Imperial County recorded total annual precipitation of only 1.16 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

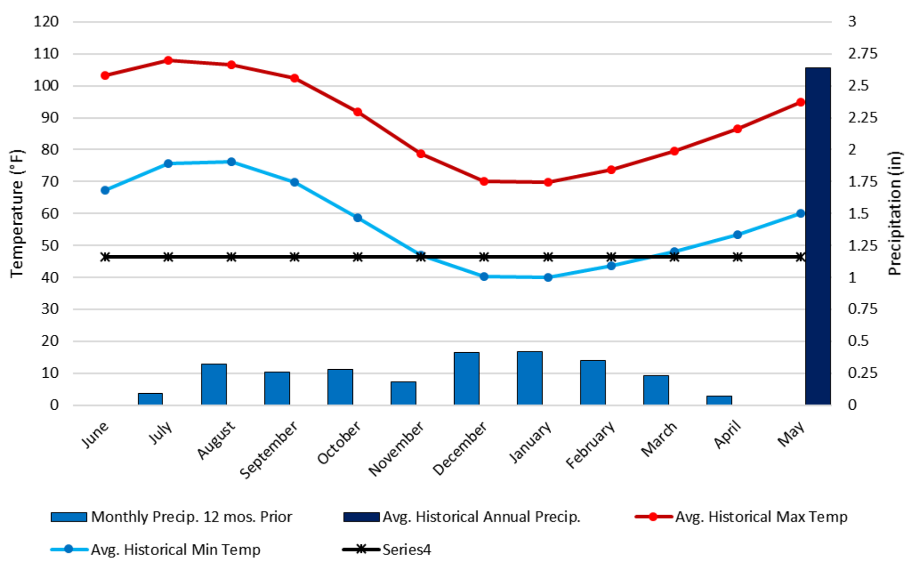

Fig 2-16: Historical Imperial County weather. Prior to May 25, 2016, the region had suffered abnormally low total precipitation of 1.16 inches in the 12 months prior. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713.

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[3] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for May 25, 2016, which was caused by one of a series of low-pressure troughs with accompanying cold air aloft that coincided with maximum heating of the surface, creating enough unstable energy that resulted in strong winds and light showers, moved through Southern California exiting east towards Arizona. The month of May of 2016 experienced a series of low-pressure troughs that moved through the Western States and into Southern California. As one system passed, another system would begin to deepen and move through the region in a west to east direction causing day-to-day fluctuations within the San Diego/Imperial County region.

As early as May 24, 2016, a broad trough began moving over the western United States. An upper level low slid southward over southern California before moving east during the late evening hours toward Arizona on May 25, 2016. The packing of the pressure gradient down to the surface and a strong onshore flow brought high and gusty westerly winds across the mountains and deserts of southeastern California and into Imperial County entraining sufficient dust, which affected air quality and caused an exceedance in Brawley.
Figures 2-17 through 2-19 provide information regarding the expected movement of the upper low, the tightening of the surface gradient, and the resulting surface winds across the region.

[3] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

FIGURE 2-17
UPPER LEVEL TROUGH APPROACHES REGION

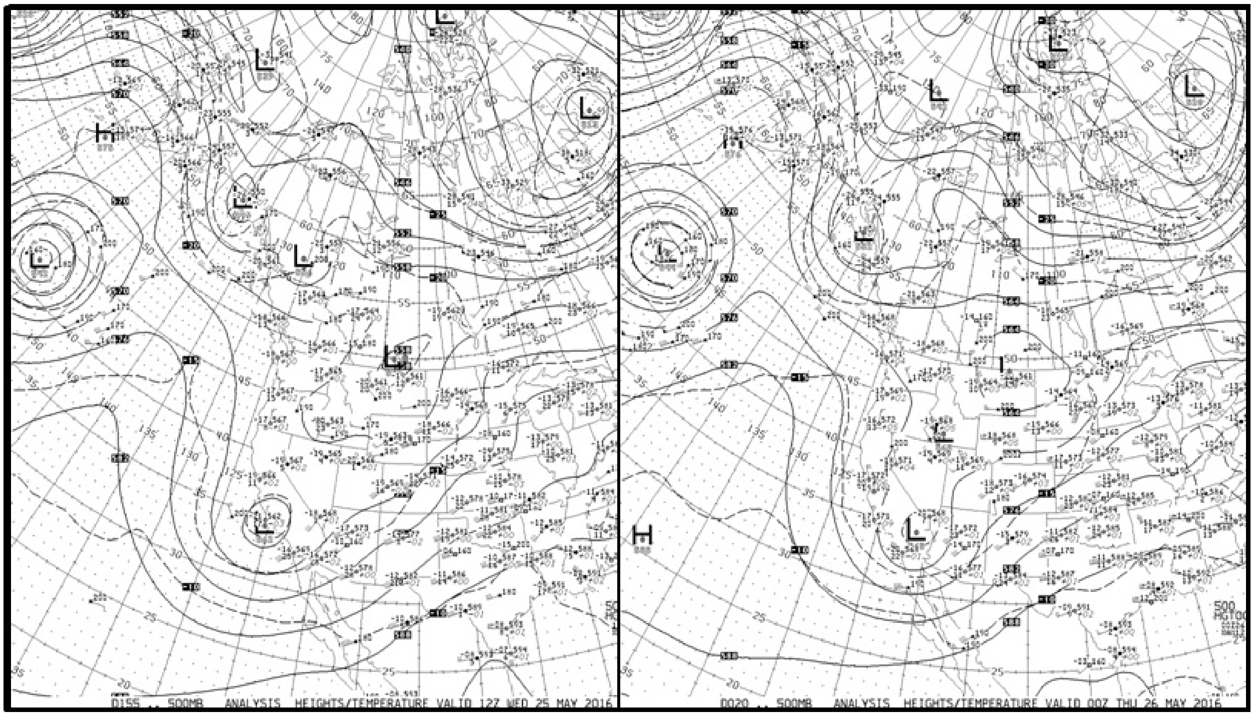

Fig 2-17: A pair of 500mb height maps showing the broad trough dominating the western states as the system moved eastward. The left image is at 0400 PST May 25, 2016. By 1600 PST May 25, 2016 (right image) the low was over the CA-AZ border. Source: Colorado State University; http://archive.atmos.colostate.edu/data/misc/QHTA11/1605

FIGURE 2-18
SURFACE GRADIENT TIGHTENS

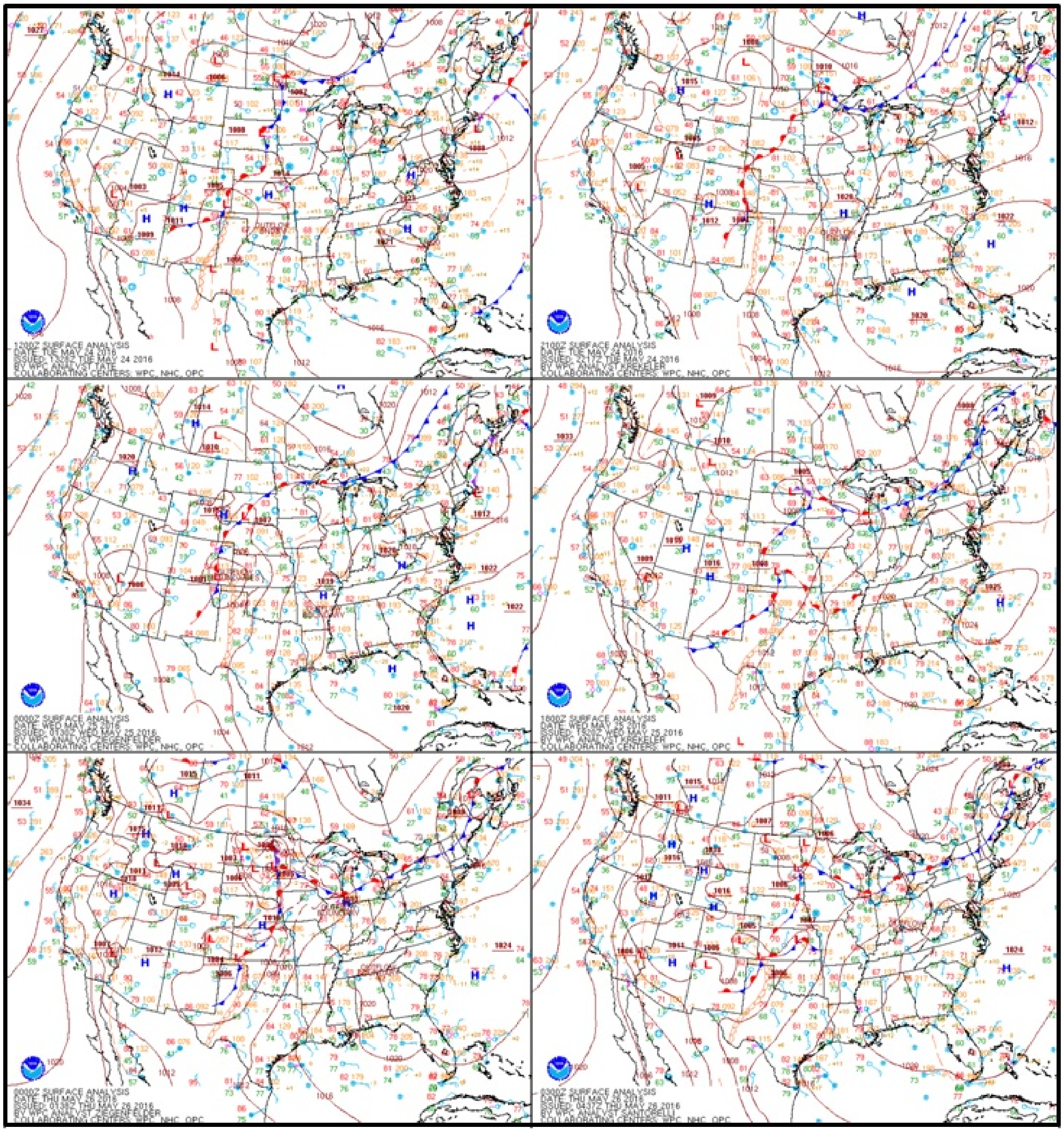

Fig 2-18: Six surface analysis maps show the tightening of the gradient over southern California from May 24, 2016 through May 25, 2016. Top left: 0400 PST May 24, 2016; top right: 1300 May 24, 2016; Middle left: 1600 May 24, 2016; middle right: 1000 May 25, 2016; bottom left: 1600 May 25, 2016; bottom right: 1900 May 25, 2016. The upper level trough pushing through the region strengthened the gradient at the surface beginning May 24, 2016. This led to strong gusty westerly winds across the mountains and deserts of southeastern California. Source: NWS Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
HIGH SURFACE WINDS

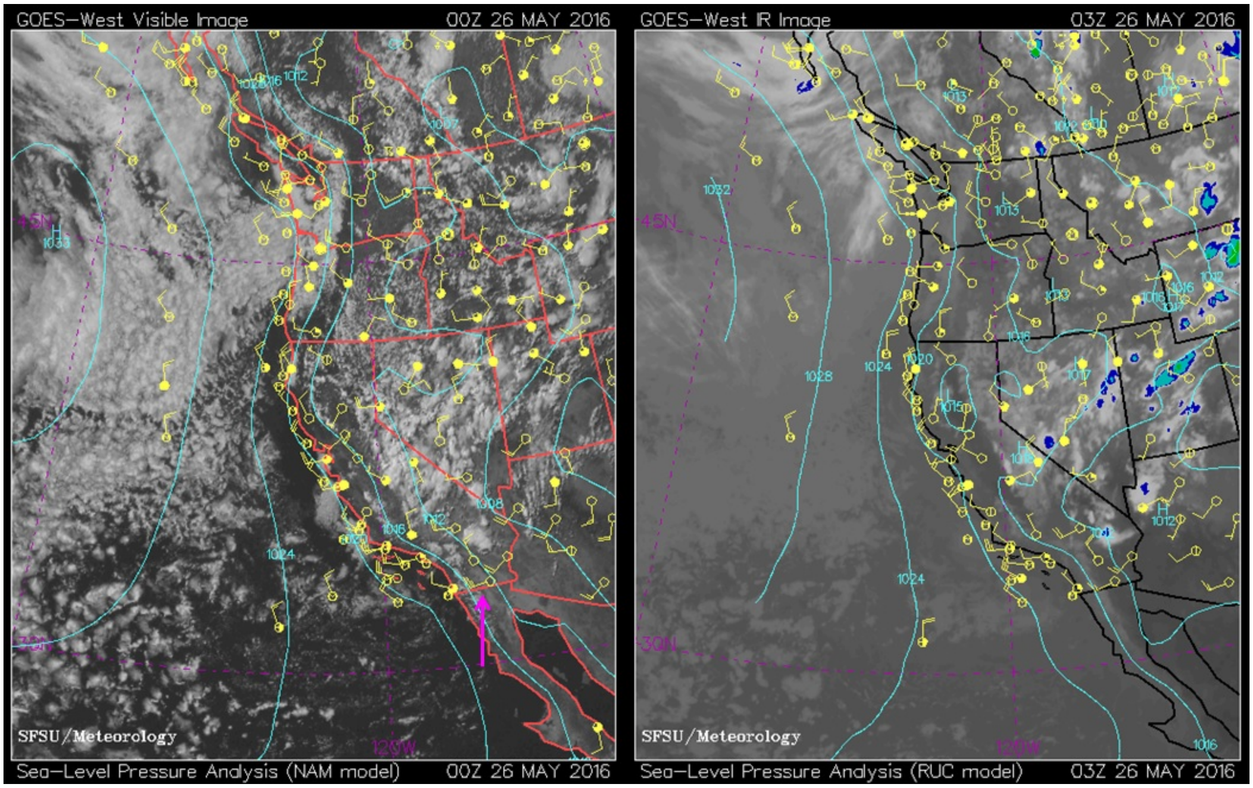

Fig 2-10: A pair of GOES-W visible (left) and infrared (right) satellite images captured at 1600 and 1900 PST on May 25, 2016. This was during the periods that Imperial County Airport and El Centro NAF were reporting gusty winds. Local airfields reported winds above the 25 mph threshold. The wind barb in the left image (see maroon arrow) at El Centro NAF depicts westerly winds of at least 28.3 mph. Peak winds were 34 mph and top gusts were 44 mph. Source: SFSU Department of Earth & Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

The NWS offices in San Diego and Phoenix issued area forecasts indicating the passage of low pressure systems, some much more intense than others throughout the month of May. The San Diego NWS office issued an area forecast on Sunday, May 22, 2016 explaining that the current trough of low-pressure over the western states would weaken but would regain strength by Wednesday, May 25, 2016. These periods of weakening and strengthening allowed for some light showers or drizzle during the evening hours over the mountains, seasonably cool weather, breezy conditions then heating of the surface. By Monday, May 23, 2016 two weak disturbances associated with a trough of low-pressure brought drizzle west of the mountains during the evening hours and expected through Tuesday, May 24, 2016. The Phoenix NWS office described the May 25, 2016 disturbance as stronger, compacted bringing gusty winds, which resulted from the pressure packing from as early as Monday, May 23, 2016.

By Tuesday evening May 24, 2016 the San Diego NWS office identified a cold core west of Point Conception that was expected to drift southeast during the evening hours of May 24, 2016 and move across Southern California May 25, 2016. Light showers associated with the trough were detected by the radar which provided the basis for expected light showers the evening of May 24, 2016 through Wednesday, May 25, 2016. The forecast concluded that precipitation would be widely scattered and light within coastal and potentially within inland valleys.

Finally, the San Diego NWS office issued an area forecast during the early morning hours of Wednesday, May 25, 2016 that confirmed the movement of the trough into Southern California along with light showers, cold air and windy conditions. By the afternoon of May 25, 2016, the Phoenix NWS office described the movement of the trough as a strong upper level low moving eastward into Southern California while the San Diego NWS office issued an Urgent Weather Message. The Urgent Weather Message contained a wind advisory, forecasting west winds 20 to 30 mph with gusts of 40 to 50 mph for the San Diego Mountains and deserts. The wind advisory expired at 2:00am PST May 26, 2016. **Figure 2-20** is a graphical illustration of the chain of events for May 25, 2016.

Winds were strong and gusty much of May 24, 2016 as the system began to approach the area. By late evening of May 24, 2016 there is brief wind shift from WSW to WNW. The brief wind shift is evident at the Imperial Airport (KIPL), the Jacqueline Cochran Airport (KTRM), most of the northern airports, located in Riverside County and the Westmorland air monitoring site. The brief shift in winds, the slight decrease in wind speeds along with scattered showers west and within the inland valleys and mountains of San Diego allows less significant amounts of entrained dust emissions into Imperial County. However, by mid-morning on May 25, 2016 winds and gusts increased with airports measuring six hours of winds at or above the 25 mph threshold at the El Centro NAF (KNJK) and two hours of winds at or above the 25 mph threshold at the KIPL. Winds gusts (20mph – 37mph) were constant between the hours of 0953 and 2053 PST at KIPL while KNJK measured continued winds gusts (24mph – 44mph) between the hours of 0956 and 1856 PST.

Elevated PM concentrations, coincident with the wind speeds and wind direction, were elevated for all northern air monitoring sites on May 24, 2016 through May 25, 2016 however, only the Brawley monitor exceeded the NAQQS on May 25, 2016. Both the Calexico and El Centro monitors measured the lowest concentrations for both days. The El Centro monitor did not measure elevated concentrations for the evening hours of May 25, 2016 because the monitor failed to meet flow standard criteria however concentrations measured during the morning and early afternoon hours measured below 38 µg/m^3.

FIGURE 2-20
RAMP-UP ANALYSIS MAY 25, 2016

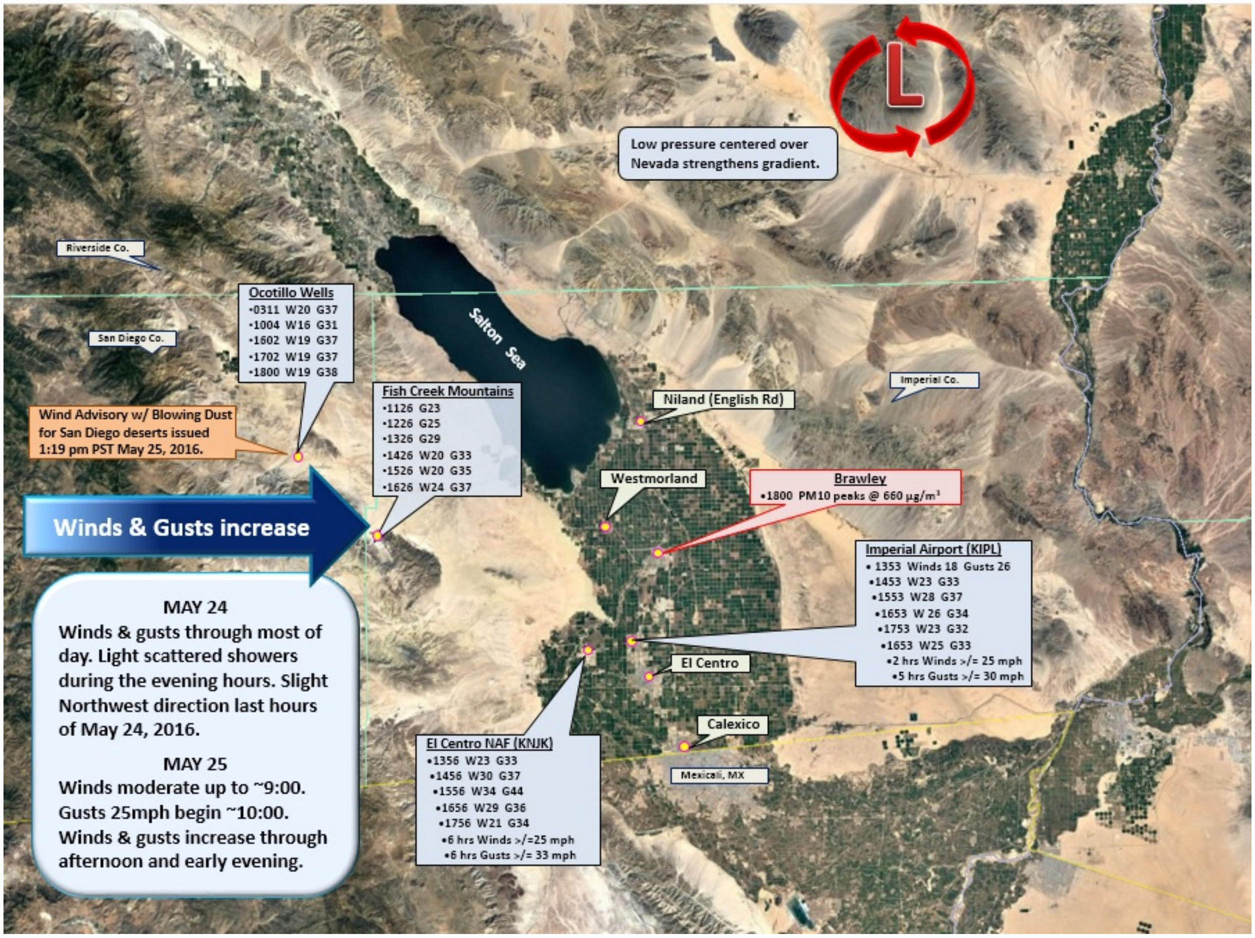

Fig 2-20: A low pressure system centered to the north tightened the surface gradient resulting in gusty westerly winds. Winds and gusts began increasing at KIPL and KNJK mid-morning and built through the afternoon. The airports measured winds at or above the 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data for KIPL and KNJK from the NCEI's QCLCD system. Google Earth base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON MAY 25, 2016

Station Monitor / Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM10 correlated to time of Max Wind Speed: Brly	Wstmd	Nld	ElC	Clx
IMPERIAL COUNTY										
Imperial Airport (KIPL)	28	260	15:53	37	15:53	263	180	245	-	208
Naval Air Facility (KNJK)	34	250	15:56	44	15:56	263	180	245	-	208
Calexico (Ethel St)	17.3	286	15:00	-	-	263	180	245	-	208
El Centro (9th Street)	14.4	266	14:00	-	-	244	76	136	38	189
Niland (English Rd)	25.5	256	15:00	-	-	263	180	245	-	208
Westmorland	14.3	272	19:00	-	-	617	93	238	-	42
RIVERSIDE COUNTY										
Blythe Airport (KBLH)	24	230	17:52	31	15:52	400	57	99	-	182
Palm Springs Airport (KPSP)	28	290	14:53	39	14:53	244	76	136	38	189
Jacqueline Cochran Regional Airport (KTRM) - Thermal	24	330	18:52	32	18:52	660	110	282	-	51
ARIZONA - YUMA										
Yuma MCAS (KNYL)	21	290	17:57	28	17:57	99	57	99	-	182
MEXICALI - MEXICO										
Mexicali Int. Airport (MXL)	26.5	290	15:51	-	-	466	180	245	-	208

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[4] depicted in **Figures 2-21 and 2-22**, indicate the path of the airflow 12 hours prior to the monitors measuring the 03:00 PST and 1800 PST hourly concentration. These hours coincide with the peak hourly PM_{10} concentrations at the Brawley monitor for the morning hours and the evening hours.

As explained above, winds were strong and gusty much of May 24, 2016 and May 25, 2016 as the system moved through the region. **Figure 2-21** helps to support the wind shift during the late hours and early morning hours of May 24 2016 and May 25, 2016. **Figure 2-22** illustrates a typical scenario when west winds (airflow) blow through the mountain passes, many times increasing in speed, down the desert slopes of San Diego County onto the desert floor.

The strong westerly winds typically blow through these mountain passes and desert slopes entraining PM_{10} across the desert floor and agricultural lands within Imperial County. It is of some worth to point out that from time to time modeled winds differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

[4] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-21
HYSPLIT MODEL – MAY 25, 2016

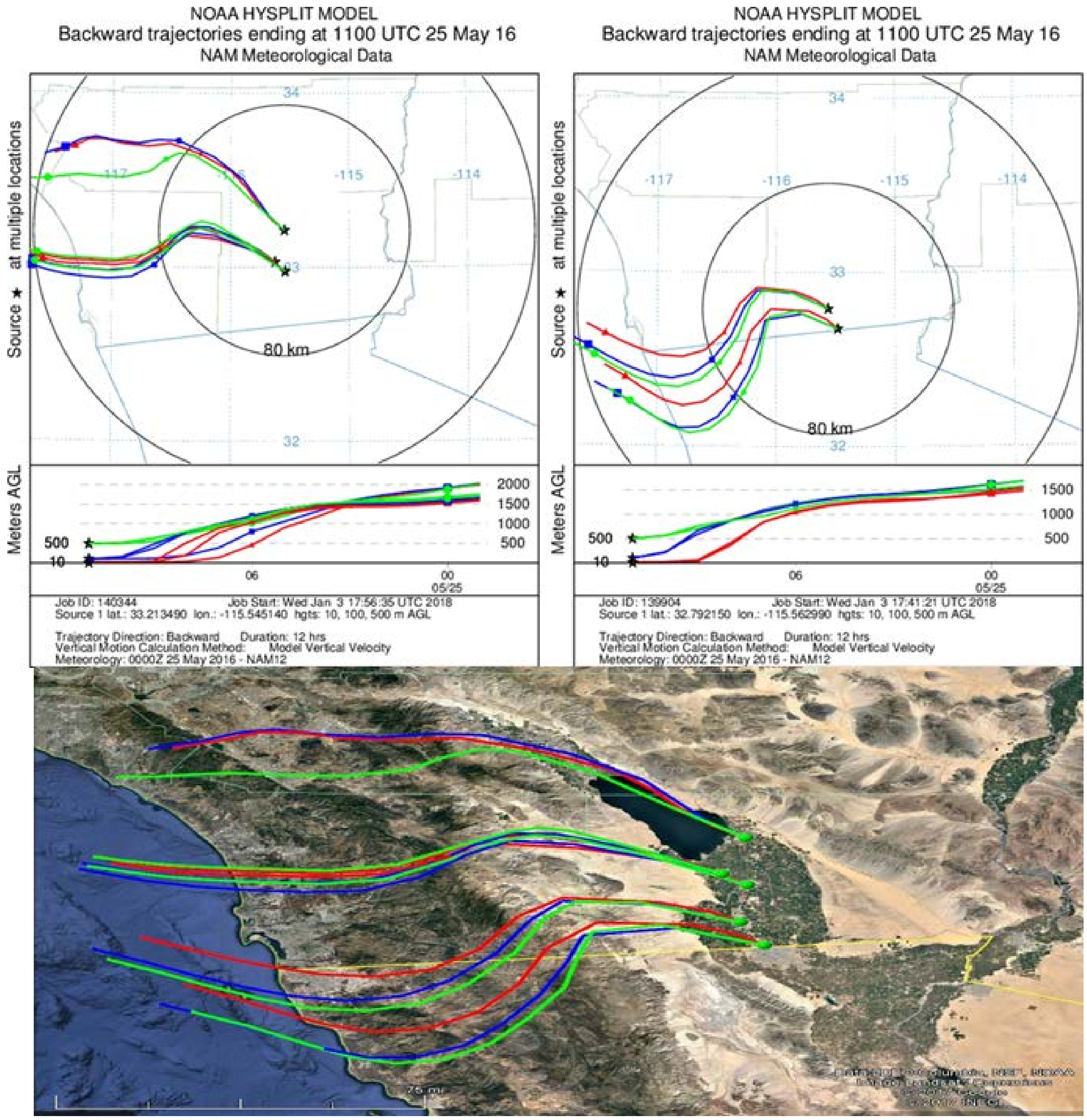

Fig 2-21: A 12-hour back trajectory ending at 0300 PST. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100m; green indicates air flow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-22
HYSPLIT MODEL – MAY 25, 2016

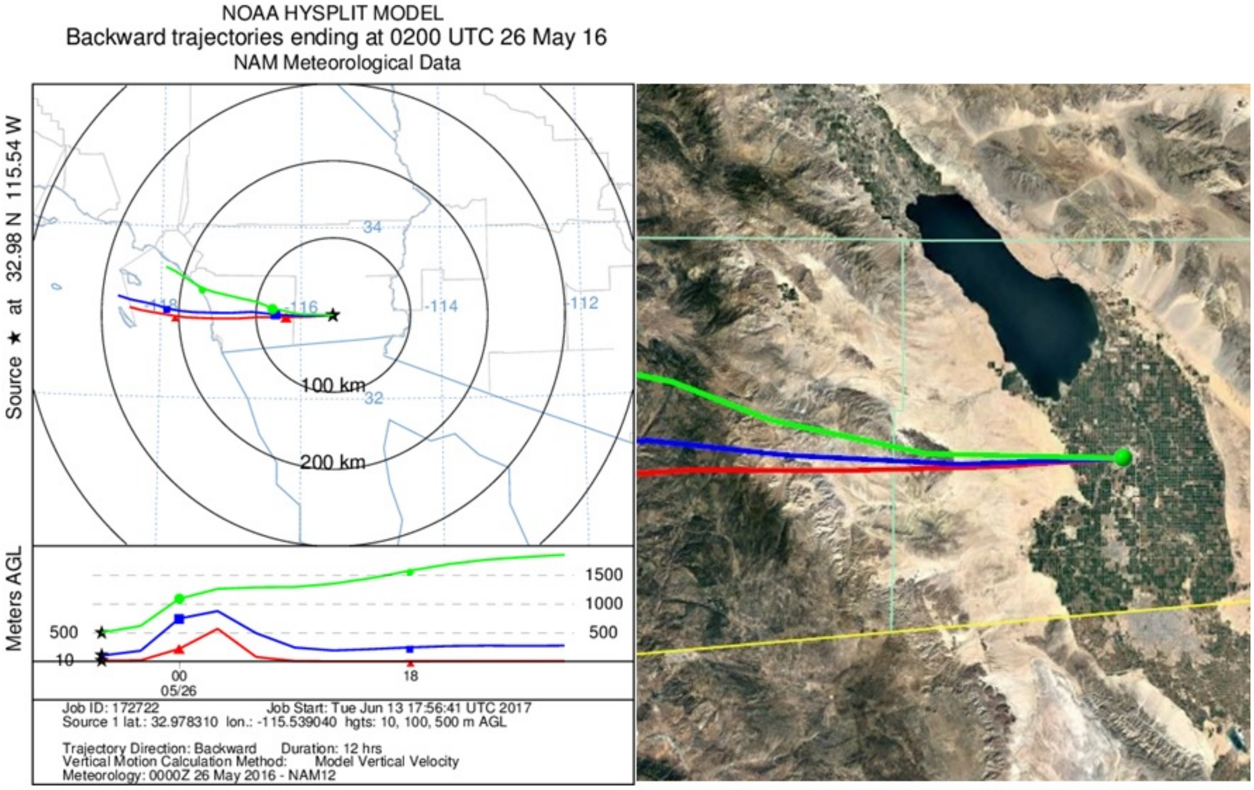

Fig 2-22: A 12-hour back trajectory ending at 1800 PST. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100m; green indicates air flow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 2-23 is a graphically representation of winds speeds for three days, May 24, 2016 through May 26, 2016. As explained above, elevated winds occurred May 24, 2016 through May 25, 2016. Wind speed decreases slightly during the early morning hours of May 25, 2016, increasing gradually until the afternoon hours when airports continually measure elevated wind speeds and gusts. The graph supports the regional extent of the high wind event. Individual wind station graphs are located in **Appendix B**

FIGURE 2-23
72-HOUR WIND SPEEDS: REGIONAL SITES

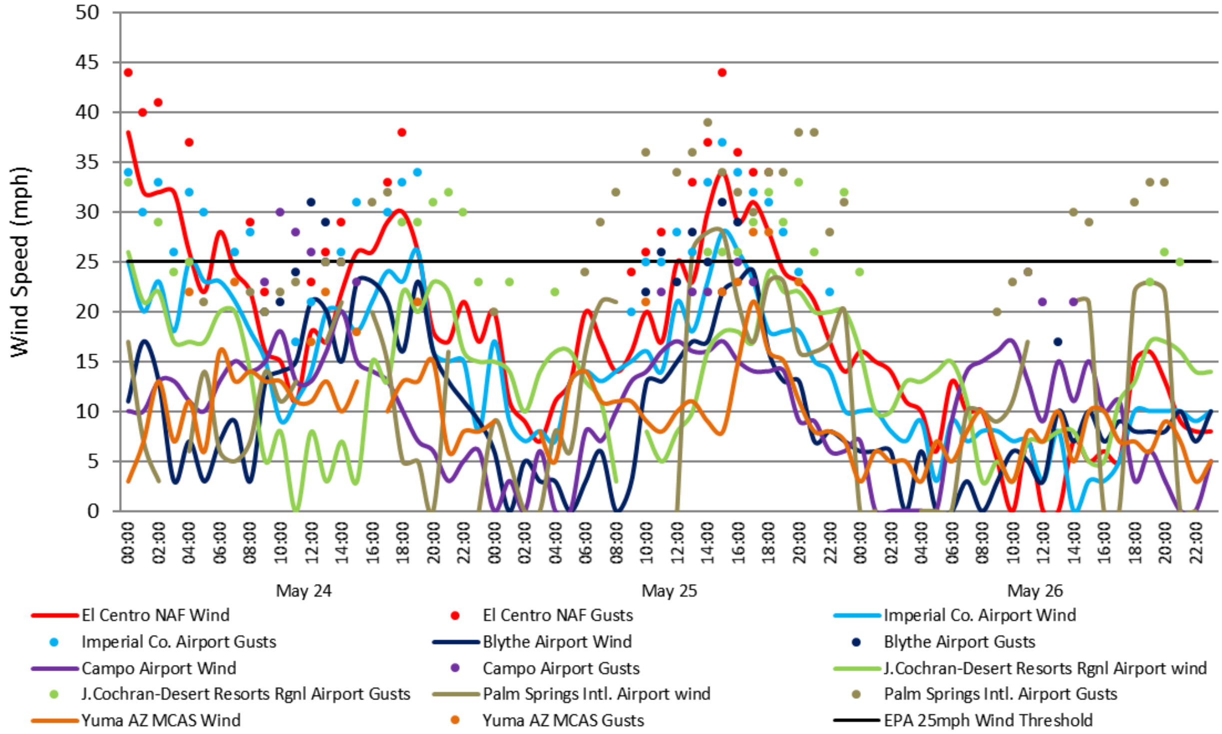

Fig 2-23: The regional effect of the high winds is reflected by the increase in wind speeds at airports during the morning and building through the afternoon. Imperial County Airport and El Centro NAF measured winds above the 25 mph threshold. Wind Data from the NCEI's QCLCD system

Figure 2-24 illustrates the elevated levels of PM_{10} concentrations measured in eastern Riverside County, Imperial County, and Yuma, Arizona. Both the Brawley and Westmorland FEM monitors show an increase in concentrations closely following an increase in wind speeds as seen in **Figure 2-23**.

FIGURE 2-24
72-HOUR PM_{10} CONCENTRATIONS AT VARIOUS SITES

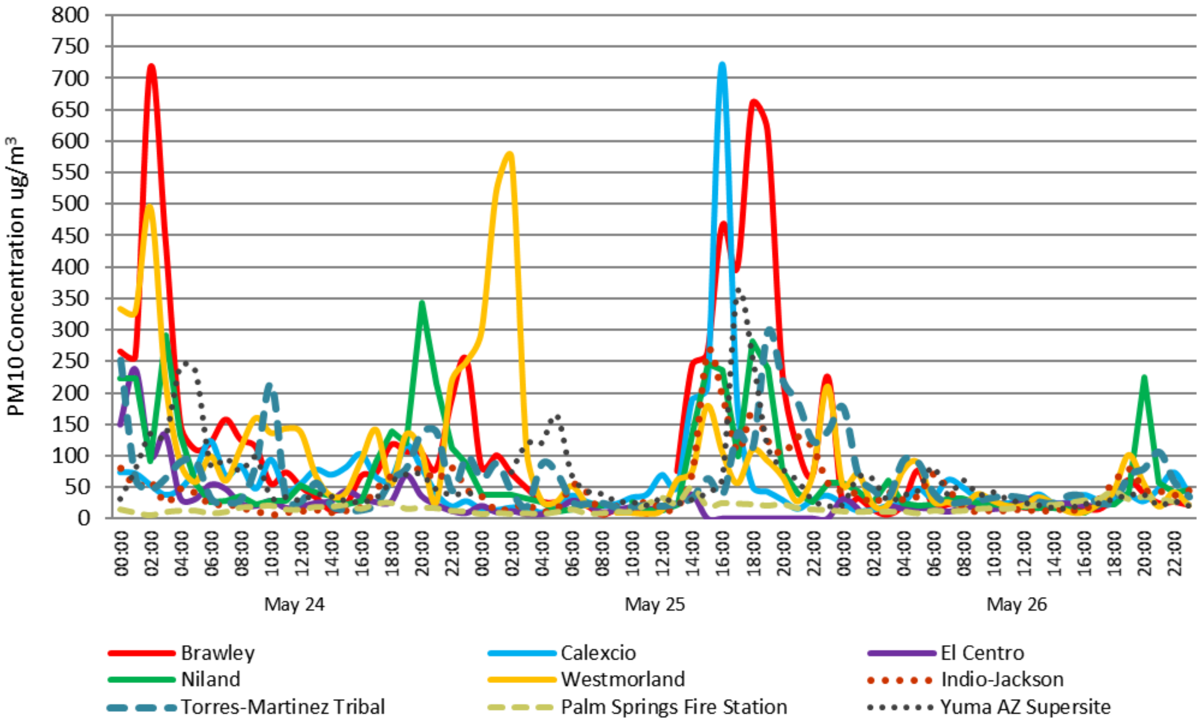

Fig 2-24: Is the graphical representation of the 72 hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at nearly all sites on May 25, 2016, demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley monitor on May 25, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the May 25, 2016 high wind event and the exceedance measured at the Brawley monitor.

Figures 3-1 through 3-2 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley station for the period of January 1, 2010 through May 25, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.[5] In order to properly establish the variability of the event as it occurred on May 25, 2016, 24-hour averaged PM_{10} concentrations between January 1, 2010 and May 25, 2016 were compiled and plotted as a time series. All three figures illustrate that the exceedance, which occurred on May 25, 2016, was outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

[5] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 25, 2016

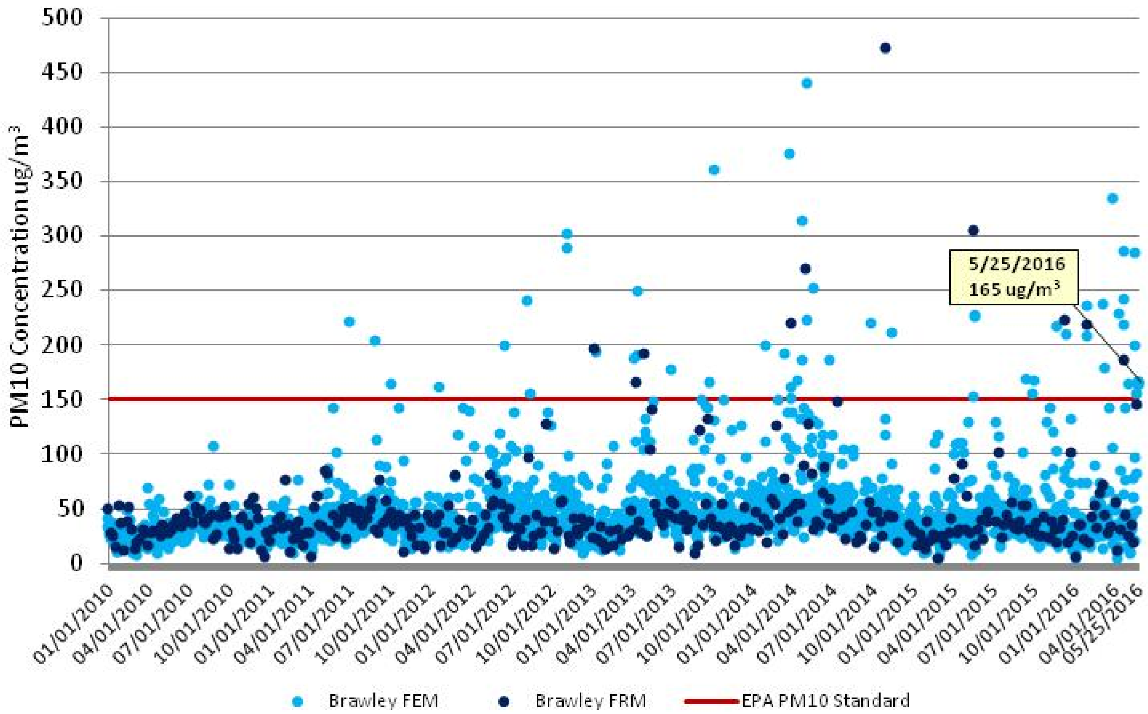

Fig 3-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 165 µg/ by the Brawley BAM 1020 PM_{10} monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold.

The time series, **Figure 3-1** for Brawley, included 2,337 sampling days (January 1, 2010 through May 25, 2016). During this period the Brawley station recorded 2,436 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and May 25, 2016. Overall, the time series illustrates that of the 2,436 credible samples measured during there was a total of 51 exceedance days, which is a 2.1% occurrence rate.

FIGURE 3-2
BRAWLEY SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
APRIL THROUGH JUNE, 2010 TO (MAY 25) 2016

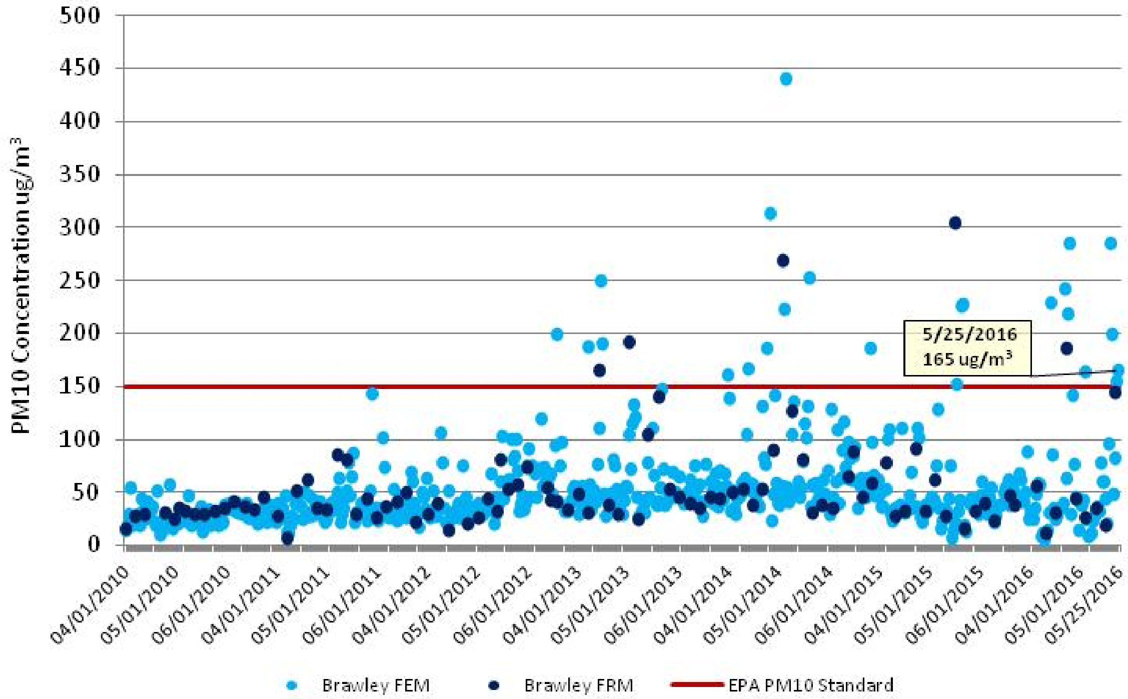

Fig 3-2: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 165 µg/m^3 by the Brawley BAM 1020 PM_{10} monitor was outside the normal seasonal concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold.

Figures 3-2 displays the seasonal fluctuations over 601 sampling days at the Brawley station for months April through June of years 2010 through 2016 (2016 ending May 25). The seasonal sampling period for Brawley contains 698 combined FRM and FEM credible samples. Of these, only 16 exceedance days occurred which translates into just 3.4% of all samples.

Figure 3-3 displays percentile rankings for Brawley over the historical period of January 2010 through May 25, 2016.

FIGURE 3-3
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 25, 2016

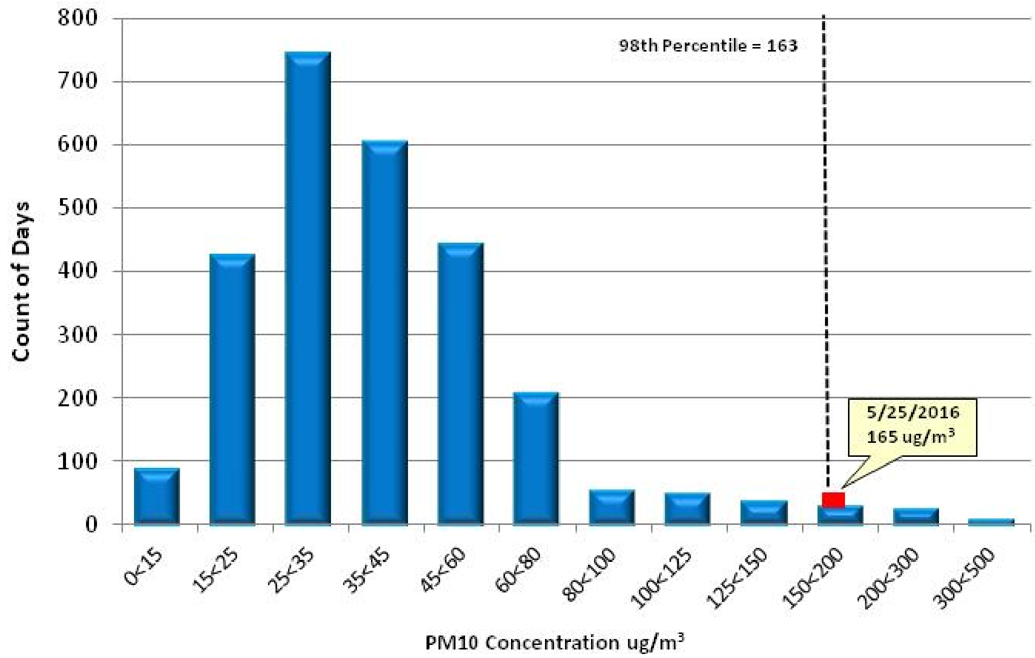

Fig 3-3: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the concentration of 165 µg/m^3 falls just above the 98th percentile at 163.

For the combined FRM and FEM data sets, the annual historical and the seasonal historical PM_{10} concentrations of 165 µg/m^3 for Brawley is just above the 98th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasonal patterns, the May 25, 2016 measured exceedance is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM_{10} concentration observed on May 25, 2016 occurs infrequently. When comparing the measured PM_{10} levels on May 25, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley monitoring site was outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the May 25, 2016 natural event affected the concentrations levels at the Brawley monitor causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on May 25, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for May 25, 2016. In addition, this May 25, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley monitor on May 25, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the May 25, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

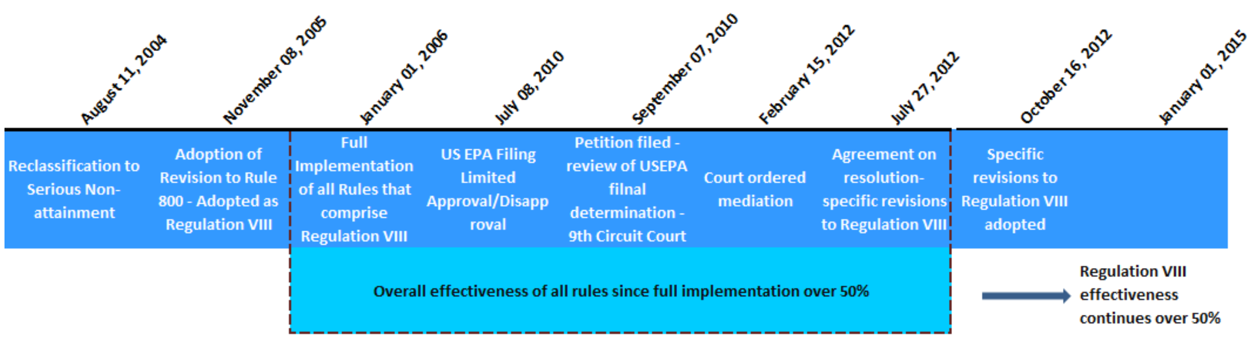

Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. The complete set of rules can be found in **Appendix D**.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;

- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On May 25, 2016 the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on May 25, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Brawley during the May 25, 2016 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. May 25, 2016 was officially designated as a No Burn day. No complaints were filed on May 25, 2016 related either to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

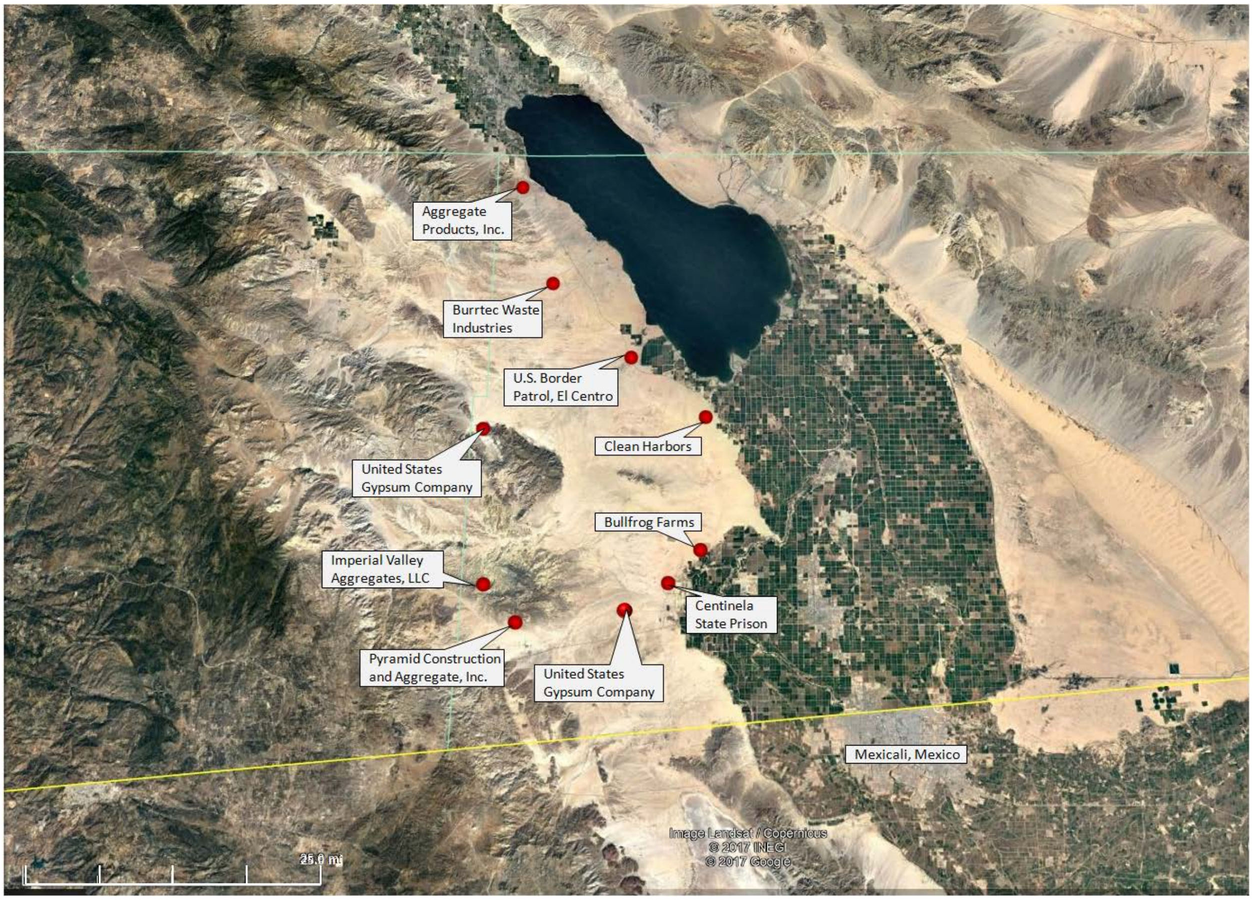

Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition the desert areas are managed either by the Bureau of Land Management or the California Department of Parks. Base map from Google Earth.

FIGURE 4-3
NON-PERMITTED SOURCES

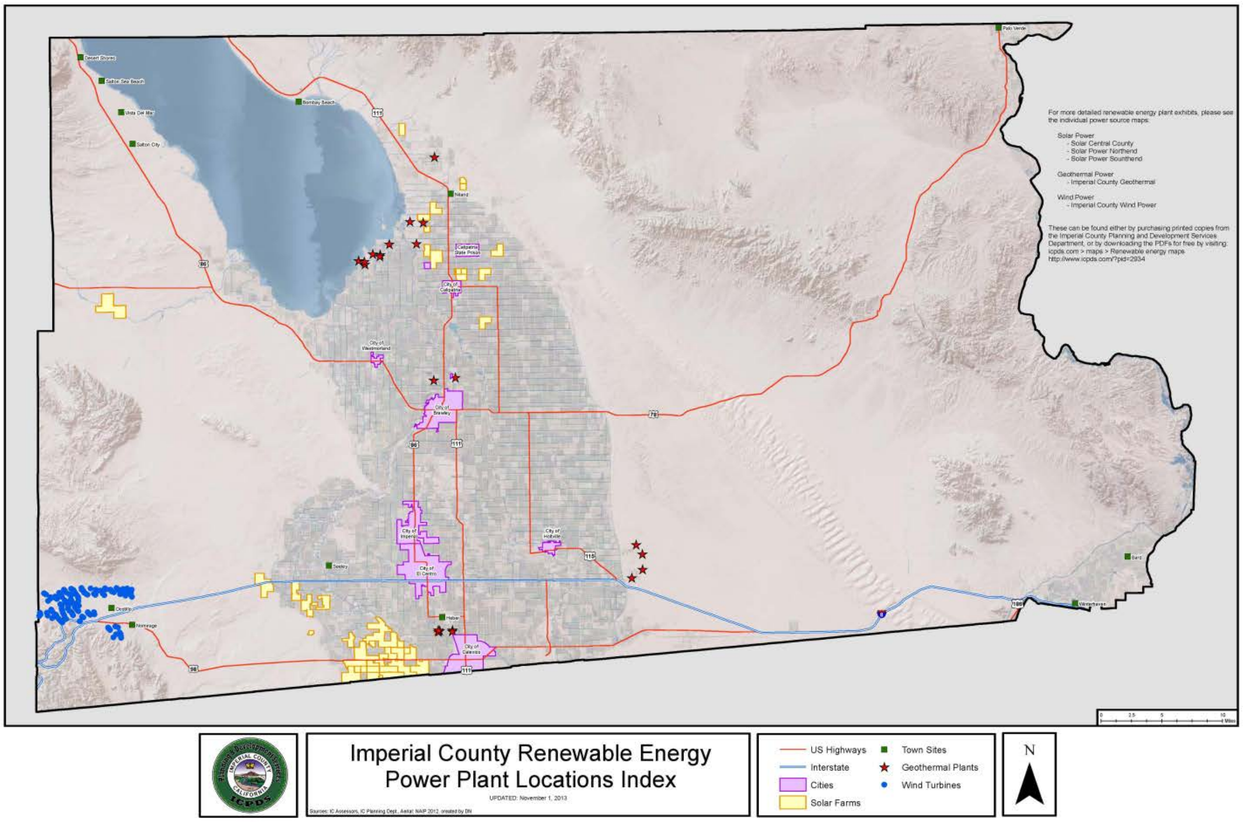

Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

The Zone Forecast for Imperial County issued by the Phoenix NWS office at 8:21 a.m. on May 25, 2016 called for west winds of 15 to 25 mph with gusts up to 35 mph. In actuality, winds and gusts were much higher. A Wind Advisory[6] for the San Diego County mountains and deserts was issued by the NWS San Diego office at 2:19 p.m. on May 25, 2016. West winds of 20 to 30 mph with gusts of 40 to 50 mph along desert mountain slopes and adjacent desert areas were expected, along with blowing dust and sand in the deserts. This area was directly upstream from Brawley during the May 25, 2016 wind event. See **Appendix A** for forecasts and advisories.

The ICAPCD and the National Weather Service (NWS) provided an extended week notification via the ICAPCD's webpage on Wednesday, May 25, 2016, that a low pressure system would pass through the region by Wednesday night bringing gusty winds. The San Diego NWS weather story

[6] A wind advisory is issued when the following conditions are met for one (1) hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016; http://www.weather.gov/lwx/WarningsDefined#WindAdvisory.

forecast and the ICAPCD web notification advised of the possibility of strong and gusty winds through the mountains and desert regions on May 25 with the potential for elevated particulate matter due to blowing dust. Affected areas mentioned in the weather story forecast included the Riverside County mountains, the San Diego County mountains, the San Gorgonio Pass, the Coachella Valley, and the Anza Borrego Desert.

IV.3 Wind Observations

Wind data during the event were collected from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County. Data were also collected from automated meteorological instruments that were upstream from the Brawley monitoring station during the wind event. El Centro NAF (KNJK) reported six hours of winds at or above the 25 mph threshold. Imperial County Airport (KIPL) experienced two hours of winds at or above the 25 mph threshold. The upstream location at the Fish Creek Mountains recorded two hours of winds at or above 25 mph (with a third hour just under), along with peak gusts of 45 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the May 25, 2016 event wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong low pressure system that moved through southern California lofted dust that caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of the Brawley monitoring station during the event were high enough (at or above 25 mph, with wind gusts of 45 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on May 25, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The May 25, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for May 25, 2016, identified one of a series of low-pressure troughs with accompanying cold air aloft that coincided with maximum heating of the surface, creating enough unstable energy that resulted in strong winds and light showers, moved through Southern California exiting east towards Arizona. This promoted meteorological conditions conducive to a tightening of the surface pressure gradient that in turn led to gusty westerly winds across the mountains and deserts of southeastern California and into Imperial County.

Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley air quality monitoring station, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations on May 25, 2016. The deepening of a surface low over the region that caused a tightening of the pressure gradient caused the strong westerly winds that affected air quality as evidenced by the Wind and Blowing Dust Advisory[7] issued for Imperial County May 25, 2016. (see **Appendix A** for forecasts and advisories).

Figures 5-1 and 5-2 illustrate the upper level low as it moved over the region and the 10mb difference from just off the California coast to just south of southern Nevada. The strong onshore flow generated high winds across southeastern California.

[7] A wind advisory is issued when the following conditions are met for one hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016, http://www.weather.gov/lwx/WarningsDefined#Wind and a Blowing Dust Advisory is issued when blowing dust is expected to reduce visibility to between 1/4 and 1 mile, generally with winds of 25 mph or greater.

FIGURE 5-1
UPPER LEVEL LOW MOVES OVER THE REGION

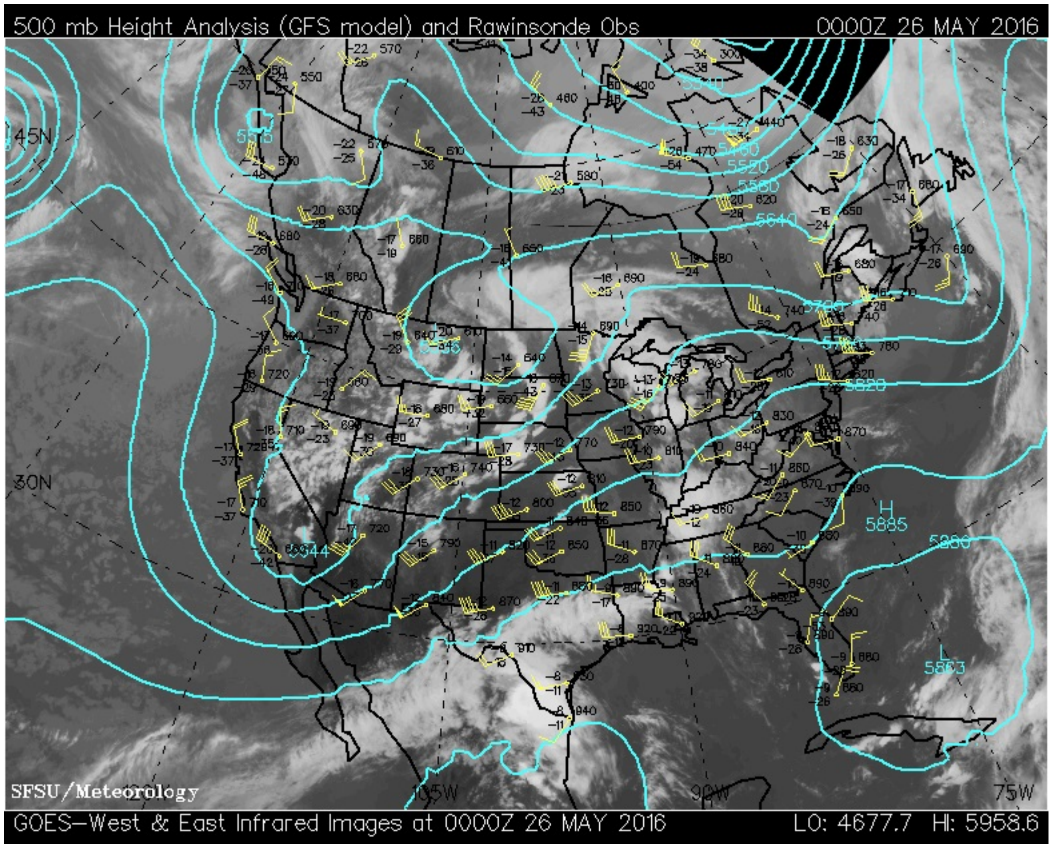

Fig 5-1: A GOES E-W infrared image shows the upper level low (500mb height) over southeastern California at 1600 on May 25, 2016. Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server

FIGURE 5-2
SURFACE PRESSURE GRADIENT PACKED

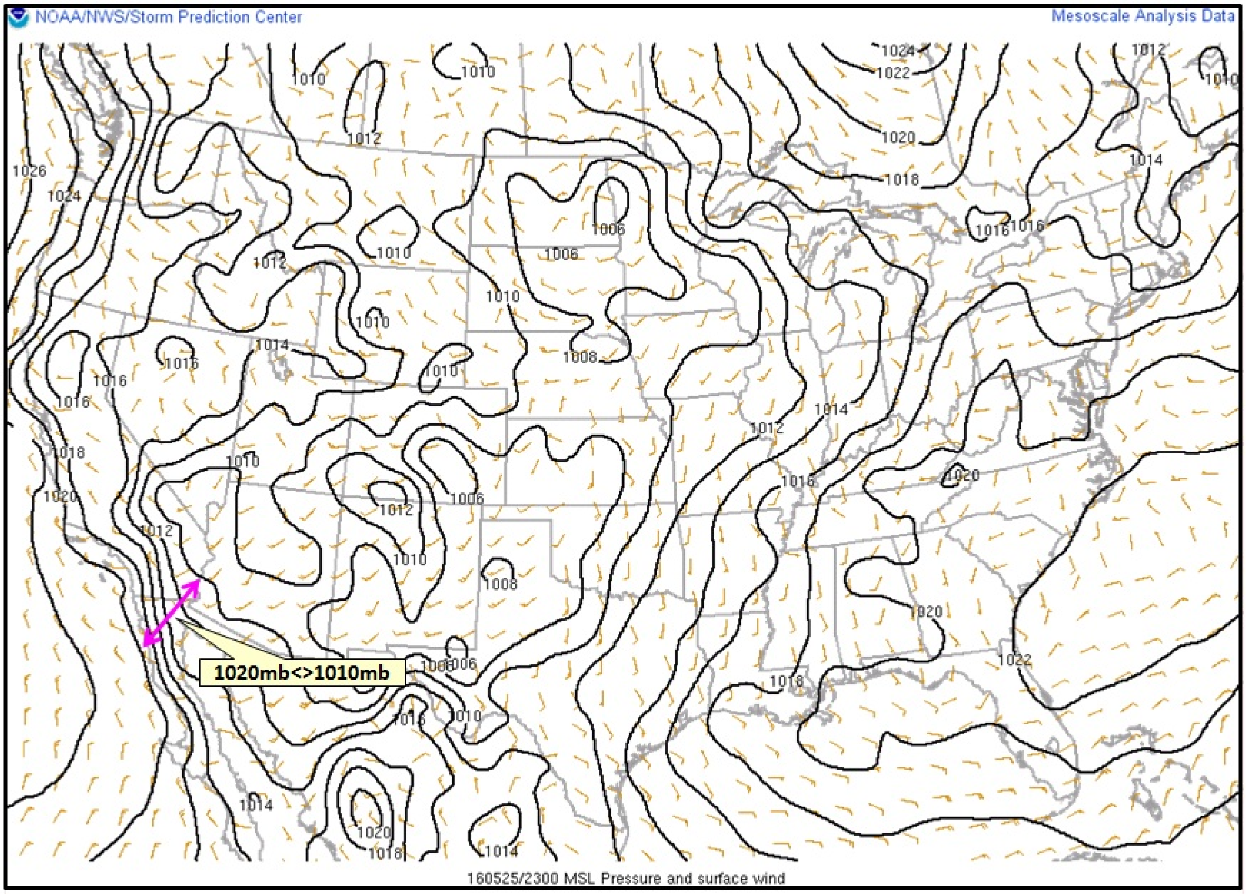

Fig 5-2: A tight pressure gradient was responsible for the high winds across southeastern California. At 15000 PST on May 25, 2016 the gradient stood at 10mb from just off the California coast to near the southern tip of Nevada. This was entering the hour when top winds and gusts were measured at both Imperial County Airport (KIPL) and El Centro NAF (KNJK). By 1500 PM_{10} concentrations at Brawley increase peaking at 1800 PST. Source: NOAA's Storm Prediction Center Archives

NOAA's Smoke Text Product identified an extensive are of elevated dust over a wide region of the western United States and northwest Mexico that included southeast California (see **Appendix A** for notice). **Figure 5-3** shows the Aerosol Optical Depth[8] using the Deep Blue

[8] Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov.

exponent[9] over the area on May 25, 2016 as captured by the MODIS instrument onboard the Terra satellite at ~10:30 PST. The greenish colors indicate large-particle aerosols that are typical of dust.

FIGURE 5-3
"DUST" AEROSOLS OVER IMPERIAL COUNTY – TERRA MODIS

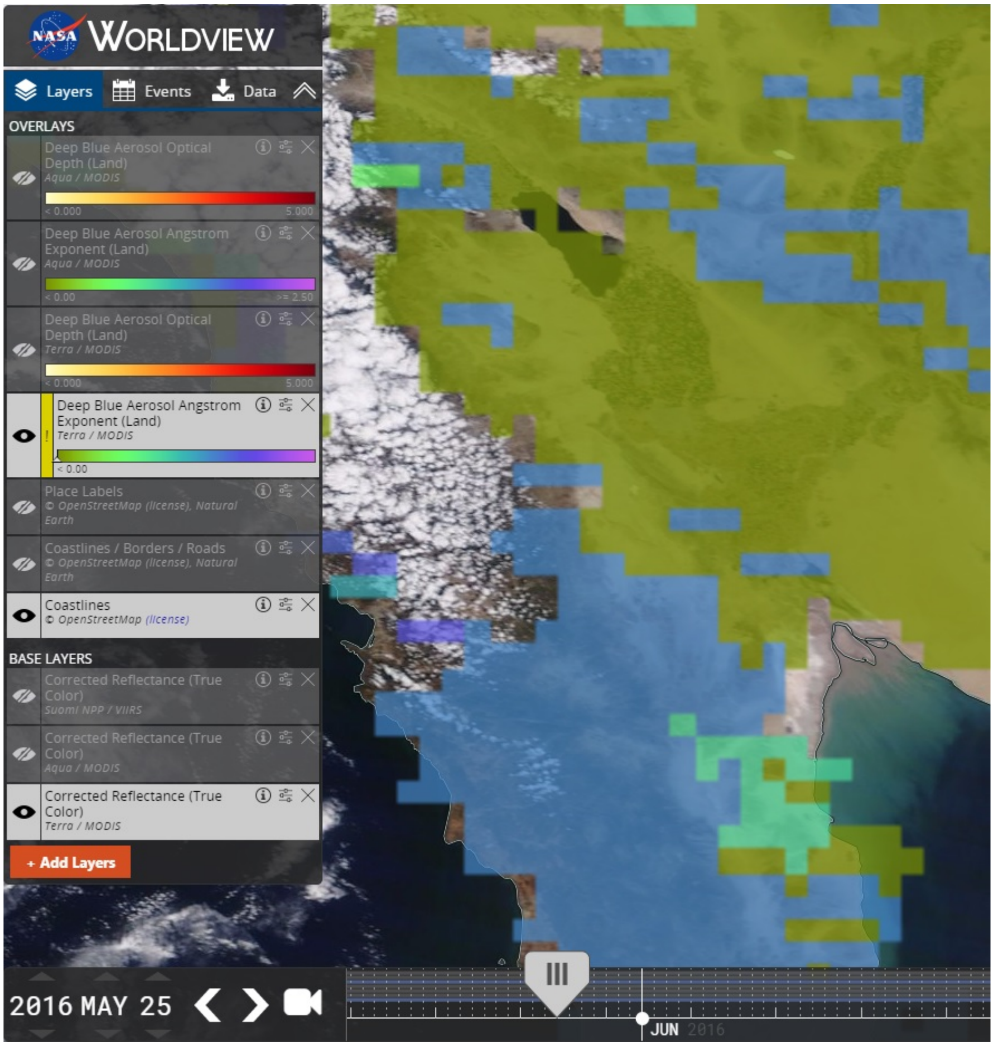

Fig 5-3: The MODIS instrument onboard the Terra satellite captured moderate to heavy patches of aerosols over Imperial County on May 25. Warmer colors indicate a heavier layer of aerosols. Source: https://worldview.earthdata.nasa.gov/

[9] The Deep Blue Aerosol Optical Depth layer is useful for studying aerosol optical depth over land surfaces. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths) where Dark Target approaches fail. The MODIS Deep Blue Aerosol Optical Depth (Land) layer is available from both the Terra (MOD04_L2) and Aqua (MYD04_L2) satellites for daytime overpasses. The sensor/algorithm resolution is 10 km at nadir, imagery resolution is 2 km at nadir, and the temporal resolution is daily. Resolution is much coarser out toward the edge of the swath.

Figure 5-4 depicts the AOD as captured by the Aqua satellite on May 25, 2016 at ~ 13:30 PST. Warmer colors indicate thicker AOD. Unfortunately, both satellites made their pass before peak concentrations were reached. However, the images, together with the Smoke Text Product, substantiate a considerable amount of aerosols over Imperial County.

FIGURE 5-4
HEAVY AEROSOLS OVER IMPERIAL COUNTY – AQUA MODIS

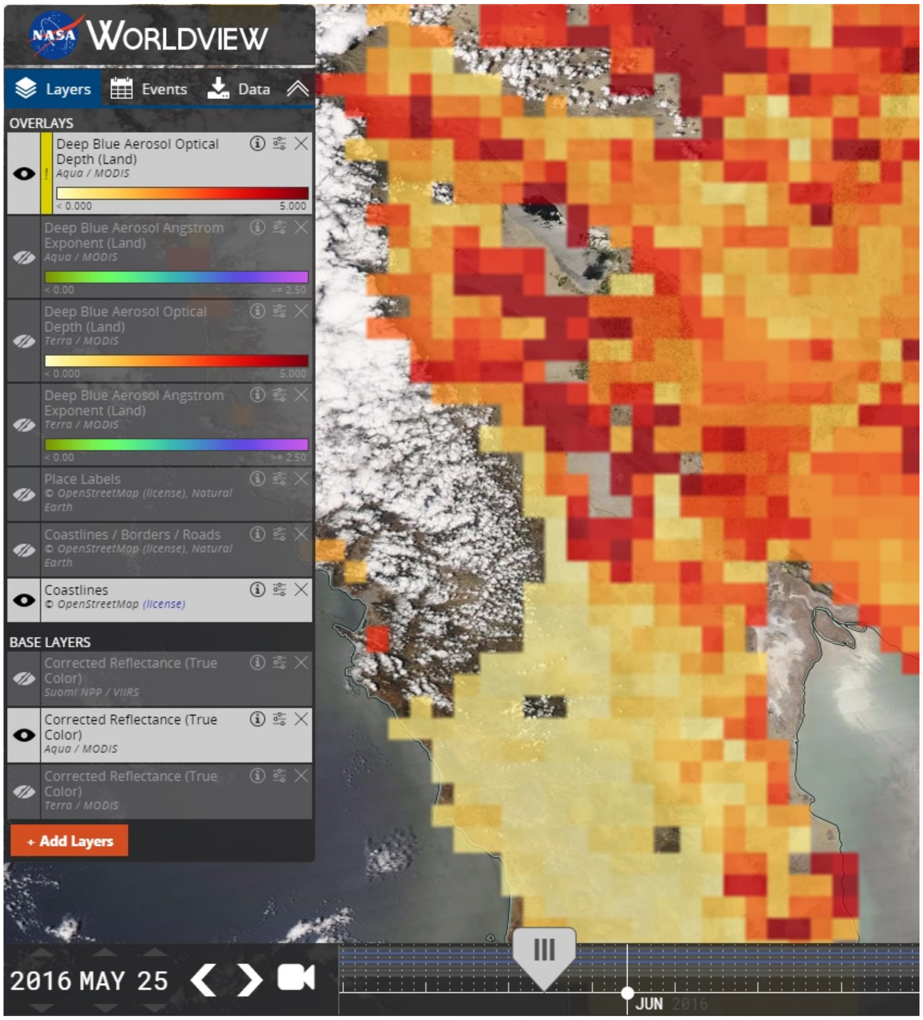

Fig 5-4: The MODIS instrument onboard the Aqua satellite captured a moderate layer of aerosols over Imperial County on May 25, 2016 at ~ 13:30 PST. Warmer colors indicate a heavier layer of aerosols. Source: https://worldview.earthdata.nasa.gov/

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[10] **Table 5-1** provides a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding station. The Brawley monitor shows peak hourly concentrations following or during the period of high upstream wind speeds.

[10] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-1
UPSTREAM WIND SPEEDS AND BRAWLEY PM_{10} CONCENTRATIONS MAY 25, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				Fish Creek Mountains (FHCC1)				Ocotillo Wells (AS938)				BRAWLEY FEM	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (μg/m³)
56	20		270	53	17		280	026	27	40	223	7	15	28	320	0	82
156	11		280	153	9		280	126	23	45	209	102	13	28	315	100	101
256	9		310	253	7		280	226	13	31	206	207	18	31	312	200	72
356	7		290	353	8		290	326	8	19	198	311	20	37	350	300	49
456	11		290	453	7		280	426	7	18	210	400	16	29	319	400	28
556	13		270	553	13		260	526	8	13	184	502	17	29	341	500	26
656	20		260	653	14		270	626	0	15		602	17	30	329	600	27
756	17		260	753	13		270	726	3	7	341	702	15	26	326	700	21
856	14		260	853	14		250	826	4	8	60	802	13	23	299	800	7
956	16	24	250	953	15	20	250	926	3	10	92	901	15	26	315	900	15
1056	20	26	250	1053	16	25	250	1026	10	16	331	1004	16	31	300	1000	14
1156	17	28	240	1153	14	25	240	1126	11	23	330	1102	13	26	323	1100	8
1256	25		250	1253	21	28	260	1226	10	25	272	1202	14	28	315	1200	
1356	23	33	240	1353	18	26	250	1326	14	29	276	1302	17	30	293	1300	76
1456	30	37	250	1453	23	33	260	1426	20	33	249	1402	17	37	313	1400	244
1556	34	44	250	1553	28	37	260	1526	20	35	258	1502	13	31	293	1500	263
1656	29	36	250	1653	26	34	260	1626	24	37	253	1602	19	37	302	1600	466
1756	31	34	250	1753	23	32	250	1726	19	36	254	1702	19	38	323	1700	400
1856	28	34	250	1853	18	31	250	1826	22	32	253	1800	19	38	300	1800	660
1956	24		260	1953	18	28	250	1926	19	32	241	1902	16	31	319	1900	617
2056	23		250	2053	18	24	260	2026	17	24	238	2002	17	29	310	2000	231
2156	21		250	2153	15		260	2126	14	29	243	2107	18	28	317	2100	113
2256	17		260	2253	14	22	270	2226	12	18	221	2202	16	28	293	2200	70
2356	14		250	2353	10		260	2326	15	29	219	2302	18	33	286	2300	226

*Wind data for KNJK from the NCEI's QCLCD system. Wind data for Ocotillo wells (AS938) and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Brawley station does not record wind data. Wind speeds = mph; Direction = degrees

Figure 5-5 depicts a 12-hour HYSPLIT back-trajectory ending at Brawley at 1800 PST during the hour when the Brawley FEM monitor measured peak hourly concentrations. Gusty winds at upstream locations west of Imperial County entrained dust downstream to the Brawley station. High winds swept down desert slopes, influenced by local terrain, toward the Brawley station. Air was dragging across the rough arid desert soils in San Diego County at 1600 PST / 0000 UTC two hours prior to reaching the monitor at 1800 (see **Figure 5-5**).

FIGURE 5-5
TIMELINE OF ENTRAINMENT

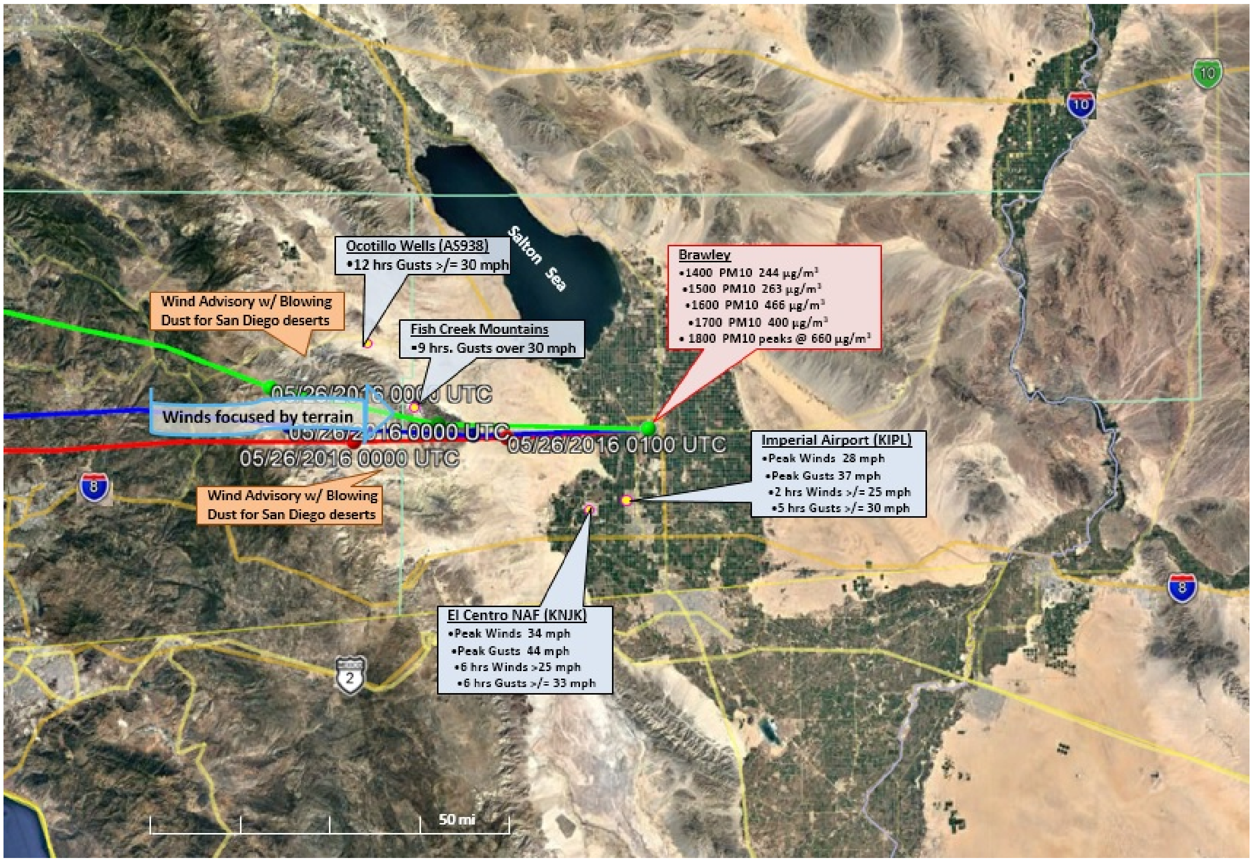

Fig 5-5: High winds blowing down desert slopes swept across the desert floor in the hours prior to reaching the Brawley monitor. Dust was entrained downstream to Brawley. The 12-hour HYSPLIT back-trajectory shows the path of airflow ending at the peak hour measured by the Brawley monitor at 1800 PST. Red trajectory is air flow at the 10m level; blue is 100m. Green is 500m. Aqua lines depict county borders. Generated through NOAA's Air Resources Laboratory. Base map from Google Earth

Figure 5-6 depicts PM_{10} concentrations at the Brawley monitoring station together with wind speeds, and wind direction over a 72-hour period at El Centro NAF and Imperial County Airport. As explained in section II, winds were elevated during the evening hours of May 24, 2016 however, during the late evening hours of May 24, 2016 there was a slight shift in wind direction from the northwest. The brief shift in wind direction and the confirmation of scattered light showers within the inland valleys allowed for less entrainment of fugitive windblown dust. After about 3:00am PST May 25, 2016 winds decrease slightly coincident with a decrease in concentrations. As winds begin to increase on May 25, 2016 PM_{10} concentrations similarly begin to increase.

FIGURE 5-6
BRAWLEY PM_{10} CONCENTRATIONS & WIND SPEED CORRELATION

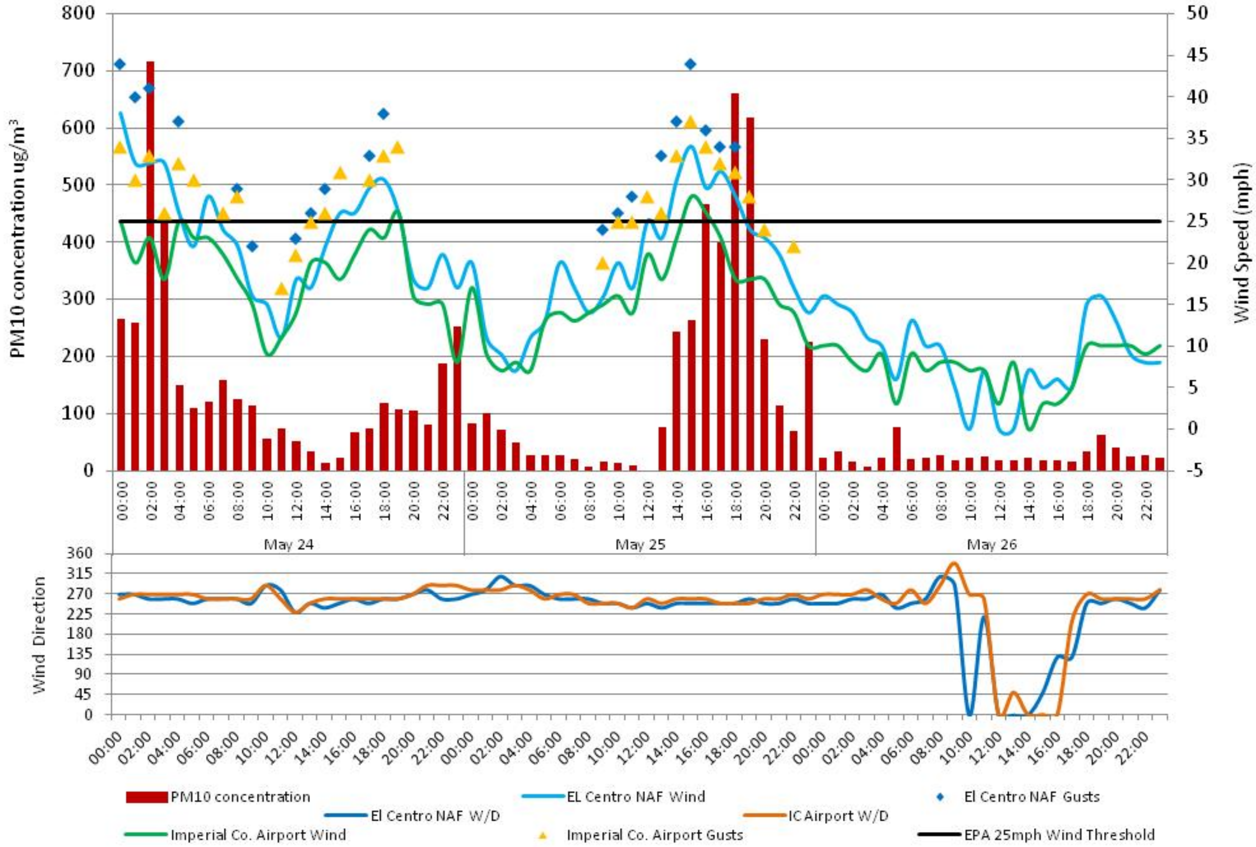

Fig 5-6: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds at the Brawley monitoring station. Brawley does not measure wind data. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

Figure 5-7 depicts the relationship between concentrations at Brawley and upstream wind speeds over a 72-hour period. An increase in winds early in the morning on May 25, 2016 coincide with an increase in concentrations. **Appendix C** contains additional graphs illustrating the relationship between PM_{10} concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

FIGURE 5-7
BRAWLEY PM_{10} CONCENTRATIONS & UPSTREAM WINDS

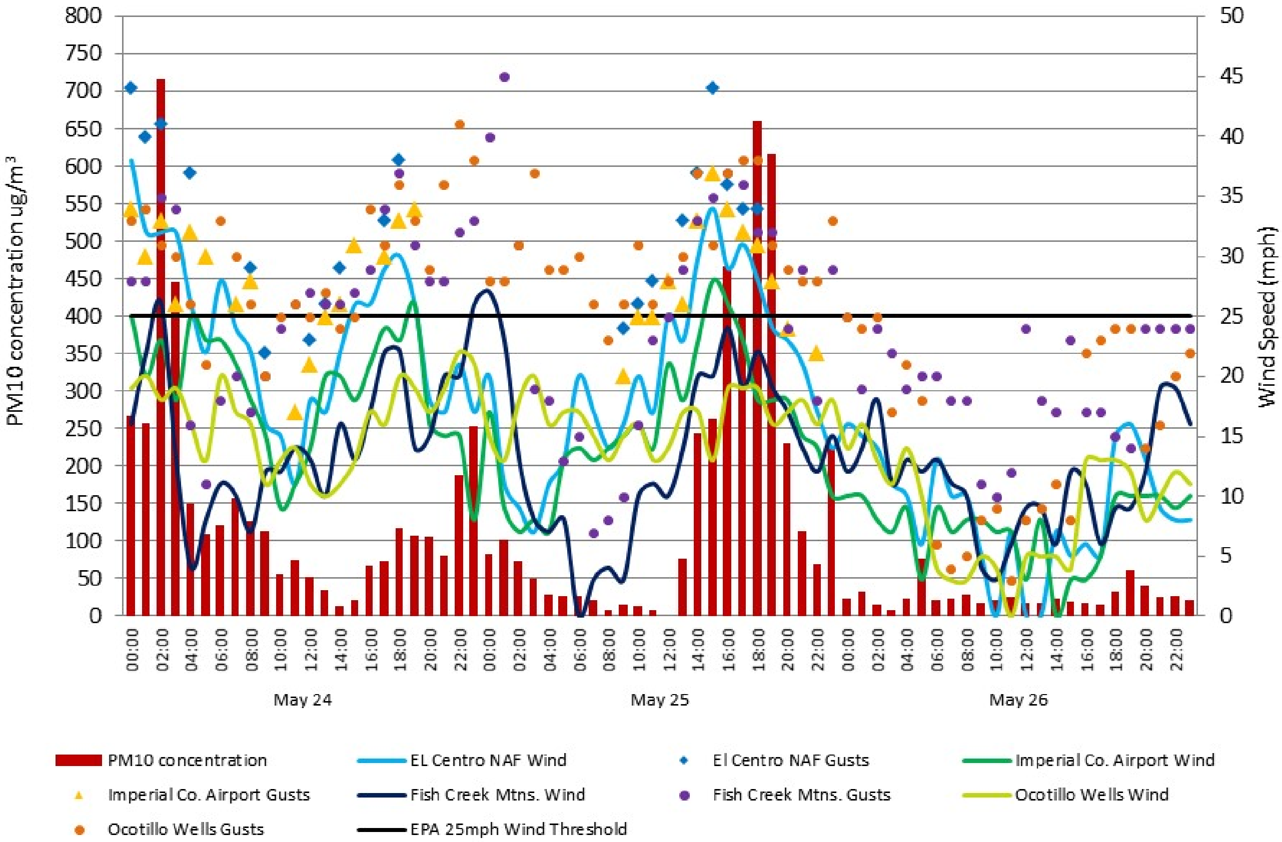

Fig 5-7: Increasing winds and gusts early in the morning, then again in the afternoon are coincident with a rise in concentrations at the Brawley monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-8 compares the concentrations at Calexico, El Centro, Brawley, Westmorland, and Niland over a 72-hour period May 24, 2016 through May 26, 2016. Visibility at Imperial County Airport (KIPL) lowered to eight miles around 1500 PST. Brawley, located downstream, shows a spike in concentrations shortly afterwards.[11]

[11] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm

FIGURE 5-8
72-HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

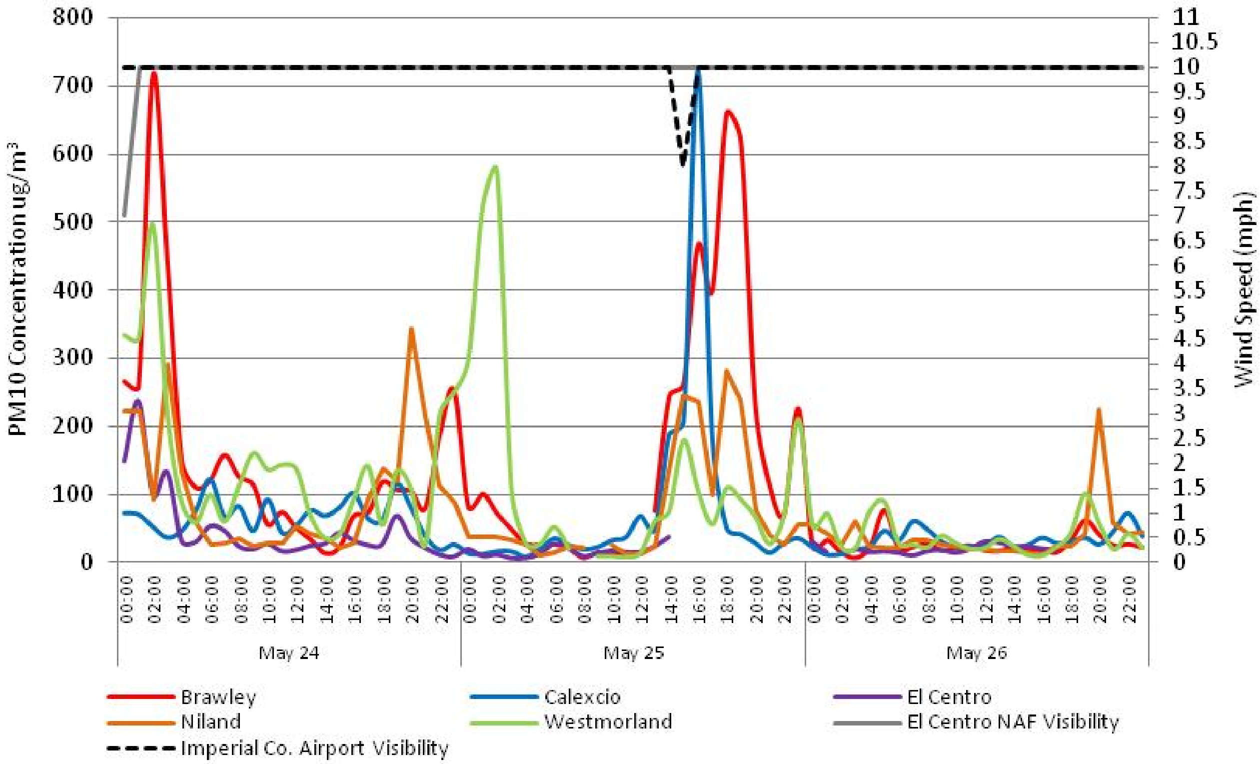

Fig 5-8: Visibility as measured from Imperial County Airport (KIPL) shows that visibility reduced significantly at KIPL prior to the measured peak concentrations at Brawley and Westmorland. KIPL is the closer of the two airports to Brawley and Westmorland. Visibility data from the NCEI's QCLCD data bank

The May 25, 2016 wind event affect all monitoring stations in Imperial County. The northern monitors all measured elevated concentrations but only the Brawley monitor measured an exceedance of the NAAQS. As explained above, while elevated winds was the primary factor for elevated concentrations, the shift in wind direction combined with scattered light showers within the Inland Valleys of San Diego County during the evening hours of May 24, 2016 and early hours of May 25, 2016 contributed to less entrainment of dust into Imperial County.

Figure 5-9 illustrates some of the elements that contributed to less entrainment of particulate matter. West-southwest winds like those at El Centro NAF (KNJK) and the Fish Creek Mountains varied at airports while northwest winds measured at areas like Ocotillo Wells, Riverside airports and Westmorland provided conditions where less entrained dust reached inland monitors like Westmorland, Niland, Calexico and El Centro. Continual gusts at both the Fish Creek Mountains and Ocotillo Wells played an important role in entraining dust downstream to Brawley (see wind roses in **Figure 5-9**).

As mentioned above, this event impact all air monitors in Imperial County however, the northern monitors measured the highest concentrations. Westmorland had a 24-hour average of 119 µg/m³. Although Niland (English Rd) reported winds above 25 mph, much of the dust settled out of the air while crossing the Salton Sea. Calexico, El Centro, and Niland all reported 24-hour concentrations under 80 µg/m³.

FIGURE 5-9
FACTORS CONTRIBUTING TO THE EXCEEDANCE

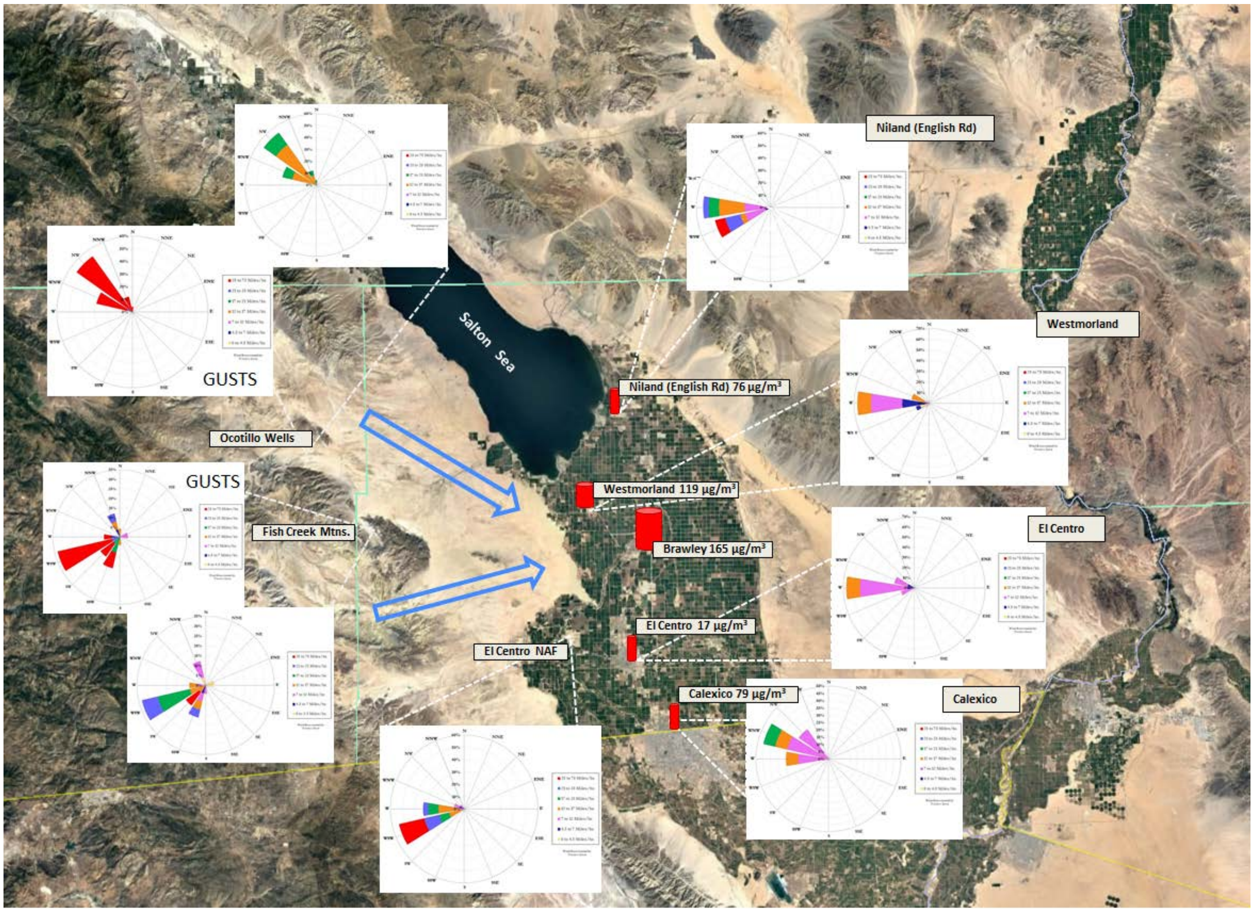

Fig 5-9: Gusty west winds caused elevated concentrations in Imperial County primarily affecting the northern monitors much more significantly than the central or southern monitors on May 25, 2016. Aqua lines depict county borders. Base map from Google Earth. See **Appendix B** for individual wind graphs and data sources

A Zone Forecast for Imperial County was issued by the Phoenix NWS office at 8:21 a.m. on May 25, 2016 forecast west winds of 15 to 25 mph with gusts up to 35 mph. In actuality, winds and gusts were much higher. A wind advisory for the San Diego County mountains and deserts was issued by the NWS San Diego office at 1:19pm on May 25, 2016. West winds of 20 to 30 mph with gusts of 40 to 50 mph along desert mountain slopes and adjacent desert areas were expected, along with blowing dust and sand in the deserts, including the Anza Borrego Desert. This area was directly upstream from Brawley during the May 25, 2016 wind event. See **Appendix A** for forecasts and advisories.

Figure 5-10 shows the Air Quality Index[12] for Brawley on May 25, 2016. Air quality began the day in the "Yellow" or Moderate level (PM_{10} 51-100 µg/m^3) until falling into the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3) at 9 p.m. where it stayed for the remainder of the day. An Air Quality Alert was issued for Westmorland on May 25 at 4:00 a.m. notifying the public that air quality had entered the "Orange" or Unhealthy for Sensitive Groups level (PM_{10} 101-150 µg/m^3). These Air Quality Indices show that the fugitive dust transported by high winds affected the air quality.

FIGURE 5-10
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
MAY 25, 2016

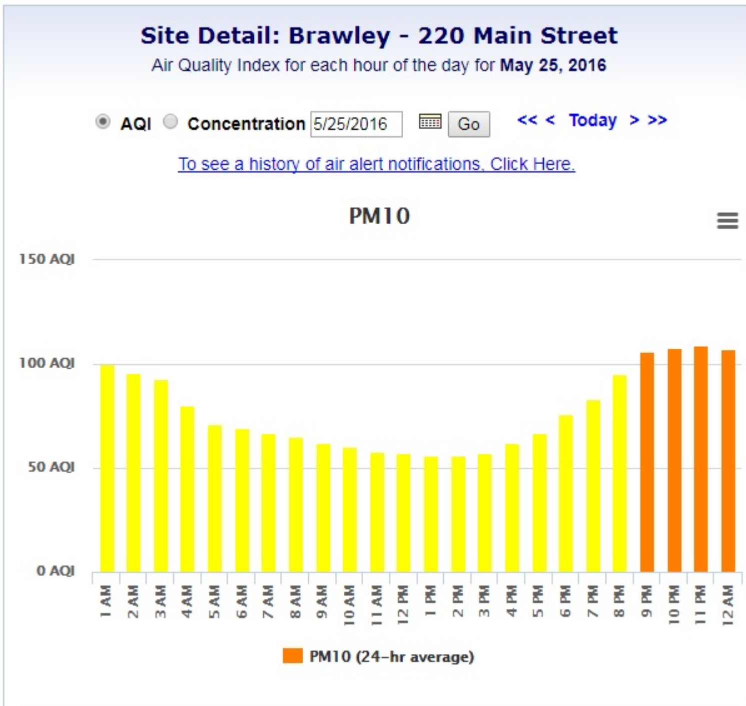

Fig 5-10: The reduced air quality in Brawley shows that the fugitive dust lofted by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives.

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the gusty west winds caused

[12] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://airnow.gov/index.cfm?action=aqibasics.aqi.

by a steep pressure gradient associated with a low pressure system that passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley monitor on May 25, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} were carried aloft by strong westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on May 25, 2016 coincided with high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-11
MAY 25, 2016 WIND EVENT TAKE AWAY POINTS

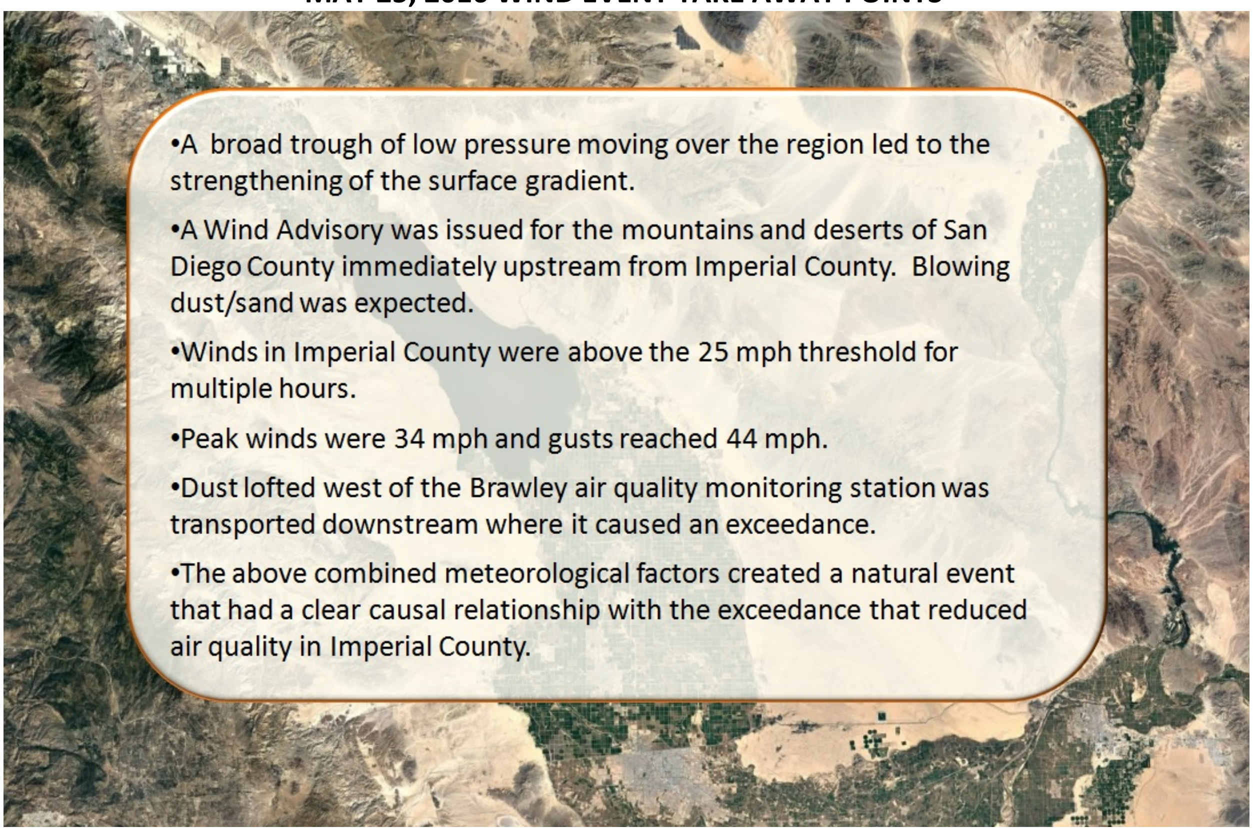

Fig 5-11: Illustrates the factors that qualify the May 25, 2016 natural event which affected air quality as an Exceptional Event.

VI Conclusions

The PM_{10} exceedance that occurred on May 25, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	5-30; 57
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	43-55; 56
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	31-35; 57
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	36-42; 56
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	43-55; 56

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the May 25, 2016 event which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played litter or no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Brawley monitor was caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that the PM_{10} exceedances at Brawley on May 25, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM_{10} exceedance that occurred at Brawley on May 25, 2016, was caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Brawley during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM_{10} at the Brawley monitoring station on May 25, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on May 25, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley monitor was historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around May 25, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial

County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM_{10} Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.